Products finishing

FRED W. VOGEL, Editor

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Products Finishing

IN its campaign to conserve materials that, because of limited supplies, have been classified as "critical" and "strategic," the Army Quartermaster Corps in the last six months has introduced substitutes for 800 articles previously used. Critical materials are defined as those available in this country but in insufficient quantities to meet our emergency needs, while strategic materials are those which must be imported.

Satisfactory substitutes have been found for bronze finishes previously used for 174 products used by the Army; in 116 items, the use of brass has been eliminated; zinc has been eliminated from 93 specifications; nickel from 78 items, copper from 66, bronze from 68, aluminum from 58. With many types of equipment, substitutes have been found for cork, chromium, cadmium, nickel, steel, rubber, manila fiber, magnesium, silk, lead, asbestos and paper.

Substitutes which have been authorized for brass include plate glass, soft annealed steel, malleable iron, galvanized iron, cast iron, ceramic ware, cast bronze and steel. In place of copper, sheet lead, steel, galvanized iron, ceramic ware, black iron, and bronze are now being specified for many Quartermaster purchases.

In many instances where galvanizing has been the standard finish, zinc is being conserved by using paint, porcelain enamel, synthetic enamel, and black japan as the finish. As a base material in a few Quartermaster procurements, zinc is being replaced by galvanized iron or steel. As a substitute for nickel plating, paint or synthetic enamel is being widely used and bronze or porcelain finishes are being used in many instances. Oxidizing, clear lacquer, brass or copper plating, and the Parkerizing process are all being used as substitutes for cadmium plating.

Steel, cast iron and malleable iron are being used as substitutes for aluminum. Since steel has also become a critical material, a number of substitutes for it have been added to Army specifications. Among these are concrete, gypsum, wood, plywood, ceramic ware, and galvanized iron. In the manufacture of Army motorcycles and bicycles, olive drab lusterless enamel is now being substituted for chromium trim.

IN response to requests for more 40-hour shift, continuous-operation schedules, Thomas W. Holland, Administrator of the Wage and Hour Division, U. S. Department of Labor, has released four schedules designated as R-1675 covering the continuous operation of plants in the war emergency without violation of the Wage and Hour Law.

These schedules are designed both to rotate the four crews among the three 8-hour periods of the day and to give every man a Sunday off at regular intervals. It is realized that these schedules will not fit all operations, but they are being issued to illustrate methods of laying out continuous-operation work charts. The principal feature of laying out a chart is to guard against a man "meeting himself coming to work at the end of a shift"; especially at the end of a cycle.

A three-weeks cycle can be laid out when 8 hours a week are used for machine reconditioning. Without this break in operation, it is not possible to give each man a Sunday off during a cycle. This can be done in a cycle of four weeks. The schedules were first submitted to the Administrator by continuous-operation industries.

FEBRUARY, 1942 Vol. 6, No. 5

A Study of the Efficiency of the Hot-Dip Galvanizing Furnace

By WALLACE G. IMHOFF
President, Wallace G. Imhoff Co.,
Vineland, New Jersey

THE mere mentioning of the word "efficiency" implies a standard of comparison. A careful study of the efficiency of hot-dip galvanizing furnaces has revealed some extremely interesting and practical facts that could only be revealed by such a careful study. It was decided to study the efficiency of hot-dip galvanizing furnaces from a practical angle, and not a theoretical angle, since the information obtained from practical facts can be used in the galvanizing industry by practical men. The selection therefore of the standard for comparison of all types and kinds of galvanizing furnaces must be a practical galvanizing furnace, in regular routine production, and on a standard galvanized product.

How the Practical Standard Was Obtained

A full-sized practical galvanizing furnace with a pot holding 21 tons of molten zinc was used to set up the standard. Under normal operating conditions various productions in pounds per hour were tried in order to discover what maximum production in pounds per hour could be put through the galvanizing bath without the bath losing temperature. The information obtained from these tests revealed that when 1,690 pounds of production per hour were put through the bath, that there was a tendency of the bath to gain temperature; and when 3,740 pounds per hour were put through the bath there was a tendency to lose bath temperature. That is more heat was being taken out of the bath than was being put in. Further tests revealed that when 2,220 pounds of production per hour were put through the bath hour after hour, under normal operating conditions, the bath neither lost nor gained temperature, and that this production was the correct production in pounds per hour that could be run through this galvanizing bath under normal, practical operating conditions.

The results of the many tests made would furnish technical material for another paper so all details will be omitted here; the facts show that the minimum amount of heat that will hot-dip galvanize a ton of steel under normal operating conditions is 344,915 B.t.u's, not including the

melting up of any new zinc to replace the metal lost as zinc coating. If we allow a maximum figure of 10 per cent for carry-over as zinc coating this gives a figure of 200 pounds of zinc that has to also be melted up for routine production operation. The melting of this zinc requires under practical conditions about 30,000 B.t.u's making a minimum routine production heat figure of 374,915 B.t.u's per ton of steel galvanized. This figure, in round numbers 375,000 B.t.u's per ton of steel galvanized, which includes the zinc requirements, may be assumed to be a standard total heat requirement per ton for all galvanizing furnaces.

The Error Involved in Calculating Practical Hot-Dip Galvanizing Furnace Efficiency

The correct figure that should therefore be used as a standard figure for determining all hot-dip galvanizing furnace efficiency should be the figure, which is the absolute minimum heat requirements for galvanizing a ton of steel under normal practical conditions, of 375,000 B.t.u's. Since in routine ordinary plant operation zinc is not added to the bath every hour, the figures which have to be used in calculating hot-dip galvanizing furnace efficiency, represent the total number of tons galvanized and the total amount of heat used. Obviously it can be seen that difficulties in obtaining worthwhile data multiply by leaps and bounds. Total figures include variations of productions in pounds per hour; they include variations in hours of operating time of the furnace; they include the time the furnace is idle over night; they include over Saturday and Sunday time; and perhaps even delay time. The case however is not so hopeless that it must be abandoned; some extremely valuable information can be obtained when the results are analyzed intelligently.

The Practical Standard Selection

Since in almost every case the practical figures do not give the amount of zinc added per hour (since in practice zinc is not added every hour), the figure that is most practical to be used as a standard figure is 344,915 B.t.u's per ton of steel galvanized during actual practical operation of the furnace.

Fig. 1—A view showing a 630-KW, 220-volt electric galvanizing furnace. The inside dimensions are 43 in. wide, 49 in. deep, and 25 ft. long. The discharge end is in the foreground with pipe being withdrawn.

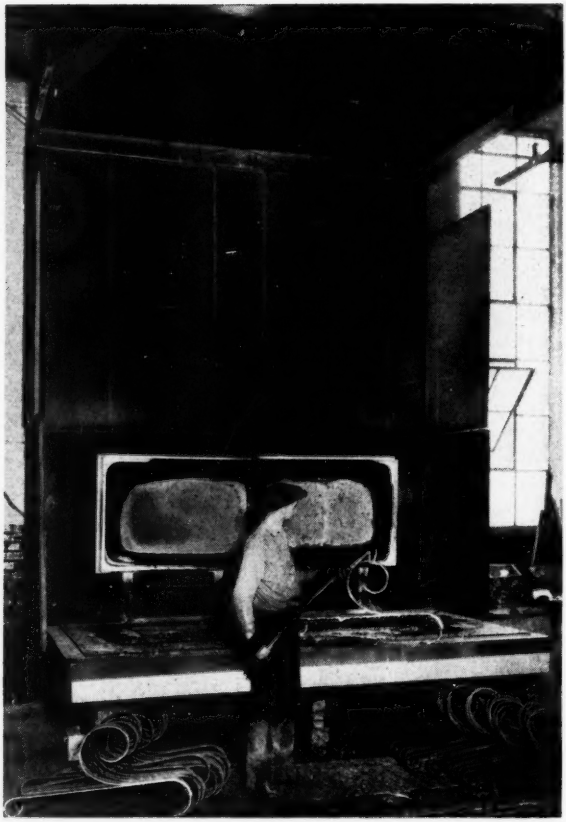

Fig. 2—An electrically heated galvanizing furnace designed for handling small castings.

Factors That Determine Hot-Dip Galvanizing Furnace Efficiency

In order to present the results of this careful study of galvanizing furnace efficiency more intelligently and more clearly to the practical man, the conclusions are stated at this point, so that the facts and figures that follow will be more clearly shown. After the data which follows has been studied it will be seen that hot-dip galvanizing furnace efficiency is a very complicated thing which depends upon—

1. The kind of fuel used.
2. The kind of furnace used.
3. The kind of work galvanized.
4. The production in pounds per hour.
5. The number of hours each day the furnace is operated.
6. The gage of the base metal; whether light or heavy.
7. Whether the figures represent only the operating efficiency alone, or the galvanizing furnace efficiency based on total tonnages and total time.
8. Insulation of the furnace, and other like factors directly affecting the furnace efficiency.
9. Human factor; which deals with production efficiency, and fuel efficiency, as well as management and operating efficiency.

Thus we see that hot-dip galvanizing furnace efficiency is an extremely intangible thing, and that it depends upon many and varied factors and influences. With all of these factors as variables it is still possible to arrive at an intelligent and very valuable discussion of galvanizing furnace efficiency.

A Check on the Practical Standard

The first practical thing to do is to furnish a check up on the figure se-

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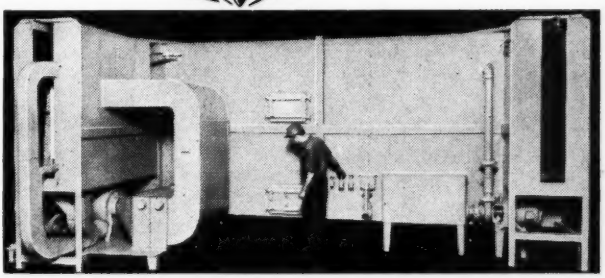

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lected as the minimum practical heat standard upon which to base other galvanizing furnace data. The check-up figures are supplied by actual hot-dip galvanizing furnaces in normal operation. The furnaces are electrically-heated hot-dip galvanizing furnaces, and the pots are heated with electricity as a fuel. According to R. M. Cherry in his article, "Electrically Heated Galvanizing Furnace," published in the Iron Age, gives the following table for the operation of a wire galvanizing furnace.

ing conditions. The standard figure is 344,915 B.t.u's per ton; the best practical checkup on this standard from another furnace is therefore the figure of 345,598 B.t.u's per ton; it therefore may be assumed that the standard figure used is all right for a standard figure of comparison for all other galvanizing furnaces, using every kind of a commercial fuel.

The data submitted in this table also shows two other basic principles which affect galvanizing furnace efficiency, namely, first that the ton-

Operation of Wire-Galvanizing Furnace

Week	Operating Hours	Standby Hours	Tons of Wire	Total Zinc Used, Lb.	Total Kwhr.	Kwhr. per Ton of Wire	Pounds Zinc Used per Ton of Wire
1	129.5	38.5	143.54	8,748	16,749	116.6	61.0
2	129.5	38.5	170.68	10,618	17,266	101.2	62.0
3	127.0	41.0	185.58	14,117	19,349	104.3	76.0
4	129.5	38.5	205.2	14,305	21,366	104.1	70.0
Ave.	128.9	39.1	176.25	11,947	18,682	106.5	67.7

Now if we change the actual heat used per ton of wire galvanized into heat units, B.t.u's per ton of wire, we get the following column of figures which might be added to the above tabulation:

	B.t.u's Per Ton of Wire Galvanized	Efficiency
1	398,189	86.6%
2	345,598	99.8%
3	356,185	96.8%
4	355,502	97.0%
Average	363,698	94.8%

The very first outstanding results of these figures show that in another full-sized practically operated hot-dip galvanizing furnace heated with electricity, actual figures show this galvanizing furnace at its best as 99.8 per cent efficient as compared with the best known heat standard for hot-dip galvanizing one ton of steel under normal practical operat-

nage put through the pot is a vital factor of furnace efficiency; (4), (7) and second that the number of hours the furnace is operated is another vital factor affecting galvanizing furnace efficiency. (5) These factors are listed as numbers 4 and 5 in the list of factors upon which galvanizing efficiency depends. A point which should not be overlooked also is that the figures show that in the same galvanizing furnace, with the same fuel, and galvanizing the same product, wire, the efficiency has varied from a low value of 86.6 per cent to a high value of 99.8 per cent.

Galvanizing Furnace Efficiency for Different Products

In the same article by Mr. Cherry in The Iron Age another table of operating figures is given for an electrically heated hot-dip galvanizing

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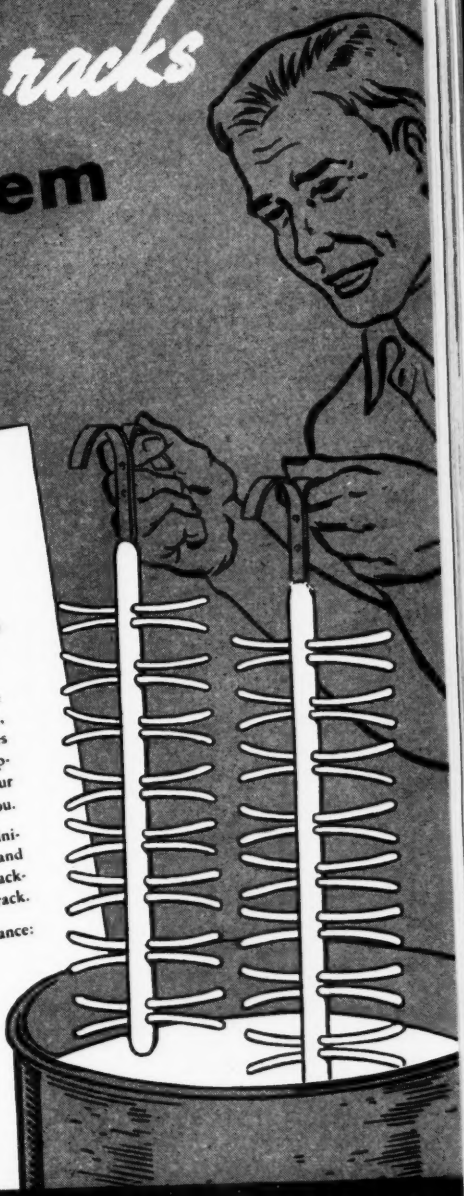

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furnace coating wrought iron pipe. The data submitted in this table is given below—

uct wire. The average efficiency for wire is 94.8 per cent; the average efficiency for pipe is 63.1 per cent;

Operation of Pipe-Galvanizing Furnace

Month	Operating Hours	Total Tons of Pipe	Total Power Consumed Kwhr.	Kwhr. per Ton of Pipe	Average Production Hourly in Tons
1	168.25	786.2	137,000	174	4.67
2	116.00	584.4	96,000	164	5.03
3	239.0	1,032.5	157,200	152	4.35
4	119.5	508.9	101,800	200	4.26
5	268.75	1,340.2	189,500	141	5.00
Ave.	182.3	850.4	136,300	160	4.67

Again turning the actual heat required per ton of pipe in heat units, B.t.u. value, we can add on to the table above the figures given below—

	B.t.u's Per Ton of Pipe Galvanized	Efficiency
1	594,210	58.0%
2	560,060	61.5%
3	519,080	66.4%
4	683,000	50.5%
5	481,515	71.6%
Average	546,400	63.1%

The first striking fact seen in this table is that the galvanizing furnace efficiency with the product pipe is very much lower than with the prod-

that means simply by changing the product from wire to pipe that 31.7 per cent efficiency of the galvanizing furnace is lost. It reveals the fact that the kind of product galvanized is a basic function of galvanizing furnace efficiency; this fact is cited in item (3) above.

Further study of the figures on pipe galvanizing again show that the galvanizing efficiency is a direct function of the "operating hours" (5), and the "total tons of pipe" galvanized (4), and the "average production hourly in tons" (4). With the maximum operating number of

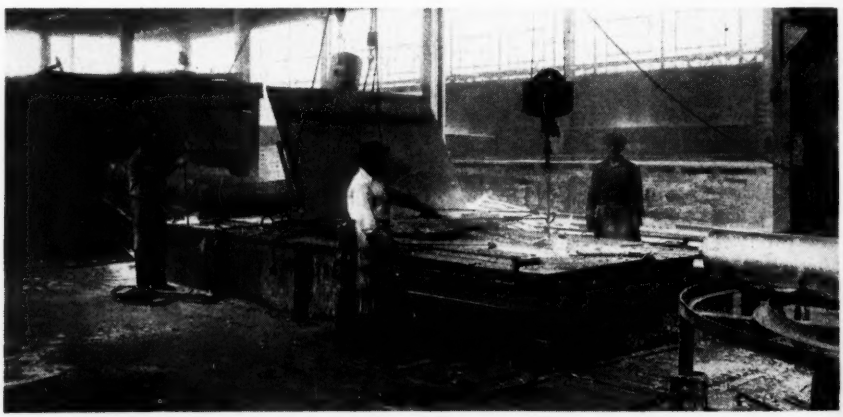

Fig. 3—View of a gas-fired galvanizing furnace for processing range boilers.

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hours of 268.75 producing 1,340.2 tons, at an average hourly production of five ton of pipe, the highest galvanizing furnace efficiency of 71.6 per cent was obtained.

Galvanizing Small Parts, Castings

In considering the efficiency of hot-dip galvanizing furnaces the first example was a product in continuous production; the second example, pipe, was that of a large article of intermittent production; we now come to small articles, castings, done by hand and intermittent production. The writer is in debt to the Westinghouse Electric & Manufacturing Company, East Pittsburgh for full data on the operation of this small electrically heated galvanizing furnace having small castings as its production. The operating data for this furnace is submitted below:

working all of the time (a thing that is not practical, and could not be done continuously because of drossing and so on) 57.7 per cent, is only 7.2 per cent higher than the lowest efficiency of the pipe furnace, and 42.1 per cent lower than the best efficiency of the wire furnace. The important facts illustrated by this example are that the galvanizing furnace efficiency is directly affected by the product galvanized (3); directly affected by the time the galvanizing furnace is operated (5), (7); and by the tonnage of production put through the furnace (4), (7).

Method of Heating Affects Galvanizing Furnace Efficiency

The standard minimum heat requirements for hot-dip galvanizing one ton of steel was obtained on a very carefully operated and con-

Working Hours Per Week	# Per Week 500 #/Hr.	Kwhr. For Work .075 Kwhr./#	Kwhr. For Holding and Heating Up	Kwhr. Per Ton	% Loss 175 — 100%	Cost of Power Per Ton 1c Kwhr.	Power Cost Per Lb. Cents	Lbs. Per Kwhr.
44	22,000	1925	1600	320	83	$3.20	0.160	6.25
88	44,000	3850	758	209.4	19.6	2.094	0.1047	9.56
132	66,000	5775	390	186.8	6.7	1.868	0.0934	10.72
168	84,000	7350	0	175	0	1.75	0.0875	11.42

Again adding the additional column of data which changes the heat requirements in the form of B.t.u's per ton, the table below shows the various efficiencies of this furnace for different operating time, and also for different production tonnages.

Working Hours Per Week	B.t.u's Per Ton	Efficiency
44	1,092,800	31.6%
88	715,101	48.2%
132	637,922	54.1%
168	597,625	57.7%

These figures are interesting indeed; the best operating efficiency that this furnace could obtain if trolled electrically heated galvanizing furnace. The additional figures and data already submitted was also all from practical galvanizing furnaces heated with electricity; it is now of interest to compare the figures obtained from practical hot-dip galvanizing furnaces heated with other fuels.

The Iron Age gives data for a wire galvanizing furnace using oil fuel. A figure of 666,000 B.t.u's per ton of product is given. On the same basis as the previous examples, and using the same standard 344,915 B.t.u's per ton for comparison, we find this wire galvanizing furnace to be 51.8 per cent efficient, a figure that is 43 per

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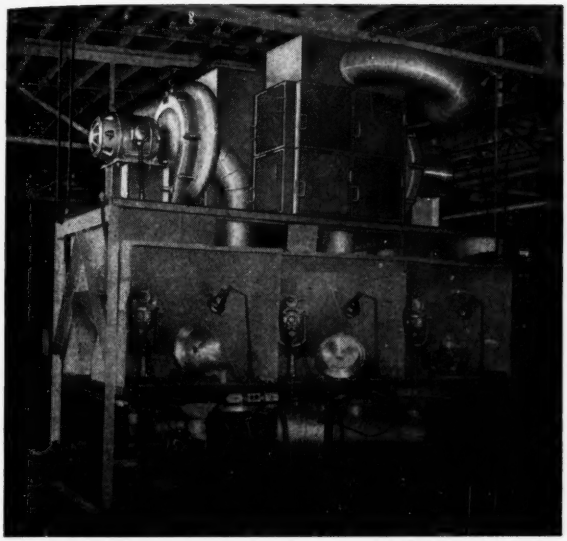

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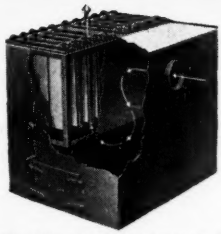

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cent below the average figure for wire galvanizing done in the furnace electrically heated.

Other figures are available for an oil-fired hot-dip galvanizing furnace doing pipe. This furnace data shows the extremely high production figure of 10 tons per hour. The B.t.u's per ton of product are given as 1,210,000. Again based on the minimum standard figure of 344,915 B.t.u's per ton of product, this gives a galvanizing furnace efficiency of only 28.5 per cent, and this figure is 34.6 per cent below the average figure of 63.1 per cent efficiency for pipe galvanizing furnaces heated with electricity.

The figures from a hot-dip galvanizing furnace doing pipe (electrical conduit), and using natural gas fuel, show 2,625,000 B.t.u's per ton of product. On the standard basis this gives a galvanizing furnace efficiency of only 13.1 per cent; 50 per cent lower than the average efficiency of the pipe furnace heated with electricity.

The figures for another wrought iron pipe hot-dip galvanizing furnace show that 1,115,100 B.t.u's per ton were required at the peak load. This galvanizing furnace was also heated with natural gas fuel. On the standard basis this gives a galvanizing furnace efficiency of 30.9 per cent; which is 32.2 per cent lower than the average figure of 63.1 per cent for the pipe furnace heated with electricity.

Another large pipe galvanizing furnace doing standard lengths of steel water pipe shows a figure of 945,000 B.t.u's per ton of steel galvanized. The fuel used is natural gas. On the standard basis that is a hot-dip galvanizing furnace efficiency of 36.5 per cent, or a figure which is 26.6 per cent below the average figure for the pipe furnace electrically heated.

A very large hot-dip galvanizing furnace doing steel water pipes in standard lengths, and heated with coke fuel, shows a value of 1,200,000 B.t.u's per ton of product coated. On the standard basis that gives a galvanizing furnace efficiency of 28.7 per cent; a figure that is 34.4 per cent below the average figure for pipe

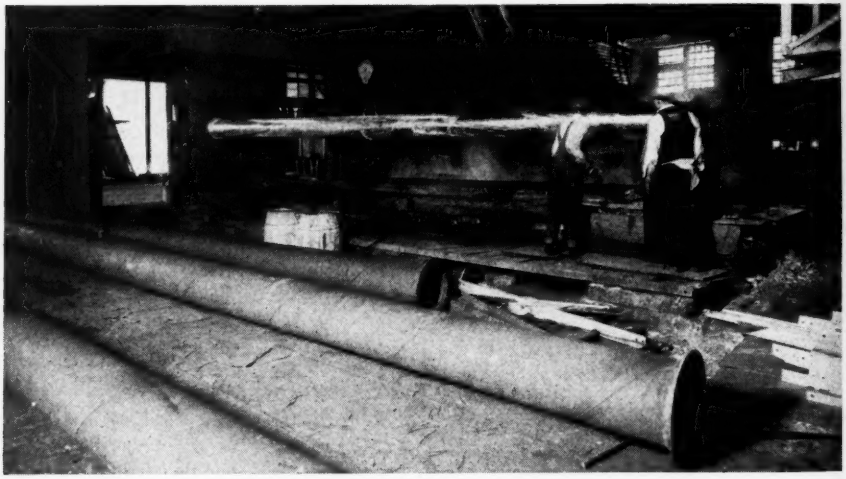
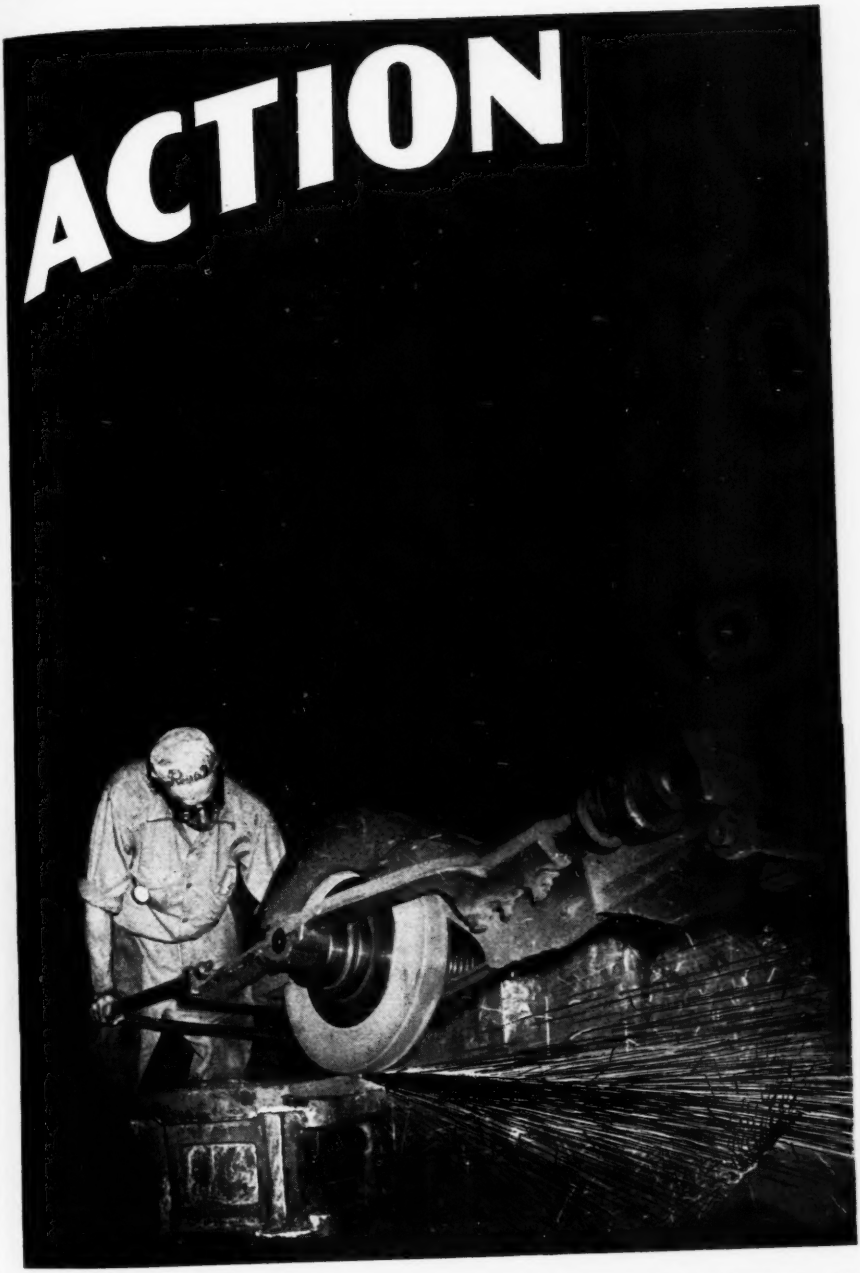


Fig. 4—Galvanizing furnace designed for handling large sections of pipe.


ACTION

galvanizing in the furnace electrically heated.

These examples clearly illustrate the fact (1) that the kind of fuel used also vitally affects the galvanizing furnace efficiency. It also illustrates (2) that the kind of galvanizing furnace used is also another vital factor, since a galvanizing furnace heated with electric heat, is designed entirely different from a galvanizing furnace heated with other fuels. Also, a coke-fired galvanizing furnace is entirely different in design from an oil or gas-fired furnace. The galvanizing furnace designs are different even for the same kind of fuels, in the same field of galvanizing. Most galvanizing furnaces at this time are insulated (8), although there are still a very large number that are not. All electrically heated galvanizing furnaces are very efficiently insulated, and this feature is one of the reasons why the efficiency of this type of galvanizing furnace is so much higher than that of other fuels.

Sheet Galvanizing Furnace Efficiency

It has been stated that the kind of work galvanized affects the galvanizing furnace efficiency (3). This has been already well illustrated by various examples just discussed. It is now very interesting to show that the galvanizing furnace efficiency varies over a wide range even in the same field of galvanizing, under the same conditions, and with the same kind of a product. Some specific examples will be given with different kinds of fuels to show this fact. The product galvanized in all instances is galvanized sheets from the standard black sheet.

In the first example the fuel used is oil, and 699,600 B.t.u's are required per ton of sheets coated. On the basis of the standard this gives a galvanizing furnace efficiency of 48.8 per cent.

A second sheet galvanizing furnace of very excellent design shows a figure of 777,600 B.t.u's per ton of sheets galvanized. This furnace also used oil as fuel for heating the zinc. Using the standard value for comparison, 344,915 B.t.u's per ton, this gives a galvanizing furnace efficiency of 44.3 per cent.

A third sheet galvanizing furnace uses natural gas as a fuel for heating the metal. A figure of 1,200,000 B.t.u's per ton of sheets is required for operation. Based on the standard this is a galvanizing furnace efficiency of 28.8 per cent.

The very delicate and complicated nature of galvanizing furnace efficiency is brought out still further by an example which shows that the galvanizing furnace efficiency on the same furnace, with the same fuel, and the same product, sheets, is affected even by the gage of the sheets put through the bath. (6) Actual figures from one of our modern sheet mills with a modern sheet galvanizing furnace heated with gas fuel, gave the following results when heavy and light sheets were galvanized.

Heavy Sheets—The actual B.t.u's used when galvanizing heavy sheets was found to be 824,250 B.t.u's per ton of sheets. Basing these figures on the standard we obtain a galvanizing furnace efficiency of 41.8 per cent.

Light Sheets—The B.t.u's when galvanizing light sheets were found to be 929,250 B.t.u's per ton of sheets. This is a galvanizing furnace efficiency of 37.1 per cent.

It will be noted already that even as rough as such figures must be due to being taken from actual operations in practice, a faint average figure of furnace efficiency seems to appear for each kind of product galvanized. For sheets the figure seems to be in the neighborhood of 40 to 45 per cent with some cases higher, and others lower.

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Efficiency of Structural Steel Galvanizing Furnaces

The average efficiency figure appears a little more clearly in the data from structural steel galvanizing furnaces. A furnace from a very large galvanizer of this product gives 1,837,500 B.t.u's as the heat required to hot-dip galvanize a ton of structural steel. This is a galvanizing furnace efficiency of 18.8 per cent.

Another galvanizer doing this type of work gives a figure of 2,006,620 B.t.u's for structural work. Both of these furnaces are heated with natural gas fuel. The efficiency of this furnace is 17.1 per cent.

Still another galvanizing furnace doing structural steel, but heated with oil fuel, shows a figure of 1,296,000 B.t.u's per ton of product. This is a galvanizing furnace efficiency of 26.6 per cent. Thus for structural steel a figure from 20 to 25 per cent is an approximate figure for the galvanizing furnace efficiency. Attention is called to how much lower the efficiency for structural steel is than for sheet steel, pipe, or wire.

Range Boilers and Tanks

The figures for a hot-dip galvanizing furnace doing range boilers and tanks average 960,000 B.t.u's per ton. The fuel used is coke. This gives a galvanizing furnace efficiency of 35.9 per cent as compared to the standard.

Another galvanizing plant doing tanks for water heaters and also range boilers averages 1,716,000 B.t.u's per ton of product. This furnace also uses coke as fuel. This is a galvanizing furnace efficiency of 20.1 per cent.

Metalware Galvanizing Furnaces

Of all the different fields of hot-dip galvanizing, that of metal ware seems to be one of the most inefficient. This is because the production is very small in pounds per hour; it is largely square foot area galvanizing of very light gage base metal, with galvanized standard water pails and wash tubs a very large part of the production.

In one plant using city gas, and with very efficient burning equipment it required 1,978,000 B.t.u's per ton of steel galvanized. This is a galvanizing furnace efficiency of 17.4 per cent. Another galvanizing furnace of another design beside this furnace and on exactly the same production gave 2,258,000 B.t.u's per ton of steel galvanized. This is a galvanizing furnace efficiency of only 15.3 per cent.

In another metal ware galvanizing plant the galvanizing furnace uses coke fuel. It required 3,432,000 B.t.u's per ton of product galvanized. This is an extremely low efficiency of only 10.0 per cent.

In still another metal ware galvanizing plant also using coke fuel it requires 2,000,000 B.t.u's per ton of steel coated. This is a galvanizing furnace efficiency of 17.2 per cent.

Pole Line Hardware Galvanizing Furnaces

A natural - gas - fired galvanizing furnace doing pole line hardware shows a figure of 1,787,500 B.t.u's per ton of product. This is a galvanizing furnace efficiency of 19.3 per cent.

One of the most striking instances illustrating how the kind of articles making up the production affects the hot-dip galvanizing furnace efficiency is shown in a pole line hardware plant having three galvanizing furnaces each one doing a different general class of work. All medium sized articles are done in one furnace which requires 2,896,000 B.t.u's per ton of product galvanized. This is

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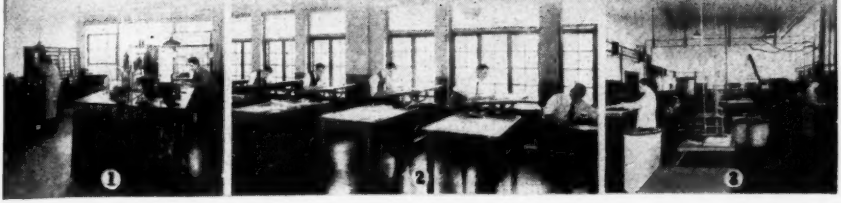

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an efficiency of only 11.9 per cent. The larger work is grouped together and done in another galvanizing furnace. This production is the same as structural steel galvanizing. For this type of work it required 2,006,-620 B.t.u's per ton of steel galvanized. This is a galvanizing furnace efficiency of 17.1 per cent. In still another furnace very small work is done. For this type of work 8,835,640 B.t.u's per ton of production were required. This is the astoundingly low figure of only 3.9 per cent efficiency.

Malleable Iron Castings and Pipe Fittings

This field of hot-dip galvanizing is also a very small tonnage field. The drastic affect upon the galvanizing furnace efficiency is shown in a few examples in this field. In one plant using fuel oil 3,456,000 B.t.u's are required per ton of products. This is a galvanizing furnace efficiency of only 9.9 per cent.

Another galvanizing on castings and fittings and using City Gas shows 2,640,000 B.t.u's per ton of product. This is an efficiency of 13.1 per cent.

Still another fittings furnace shows that 1,992,000 B.t.u's are required per ton of product. This is a galvanizing furnace efficiency of 17.3 per cent. The fuel is coke.

Job Galvanizing Furnaces

The average job galvanizing furnace handles almost any kind of work. The pots are generally very large so that every size of article may be handled from small castings up to ship plates.

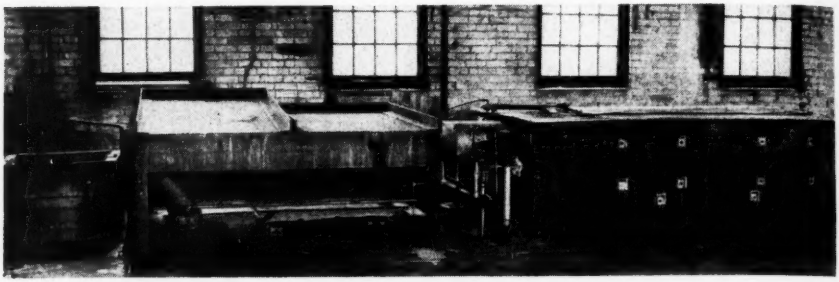


Fig. 5—This illustration shows a view of a gas-fired kettle and drier. This illustration is desgined to handle a variety of small work.

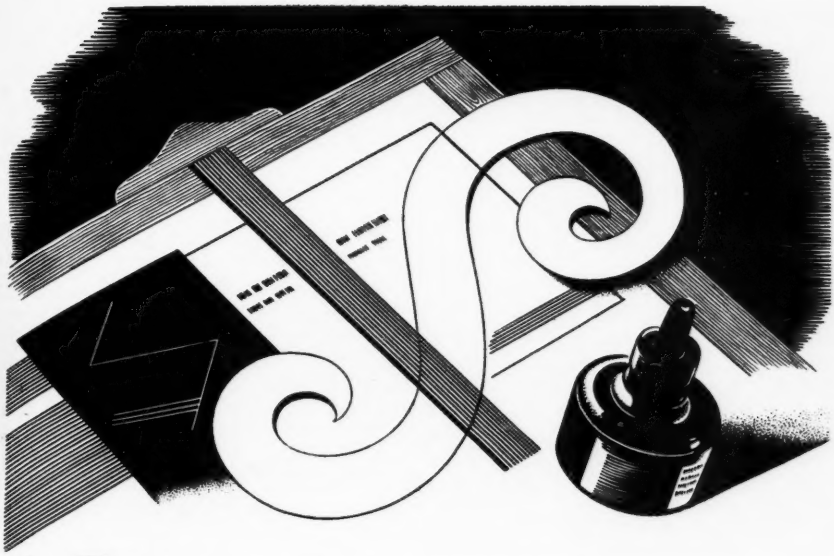
The figures for job galvanizing furnace using coke fuel show that 2,000,000 B.t.u's are required for every ton of steel galvanized. This is a galvanizing furnace efficiency of 17.0 per cent.

Another job galvanizing furnace heated with coke as a fuel shows that 1,800,000 B.t.u's are required to galvanize every ton of their product as an average figure. This is a galvanizing furnace efficiency of 19.1 per cent.

Another job galvanizing furnace appears to have a very much higher efficiency than most of the others. This furnace is operated with City Gas at 875 B.t.u's per cu. ft. Average figures show that 650,000 B.t.u's per ton are required. This is a galvanizing furnace efficiency of 53.1 per cent. The same furnace on a 24-hour basis shows that only 568,000 B.t.u's were required per ton of product galvanized. This is a galvanizing furnace efficiency of 60.7 per cent.

Conclusions

A study of the efficiency of hot-



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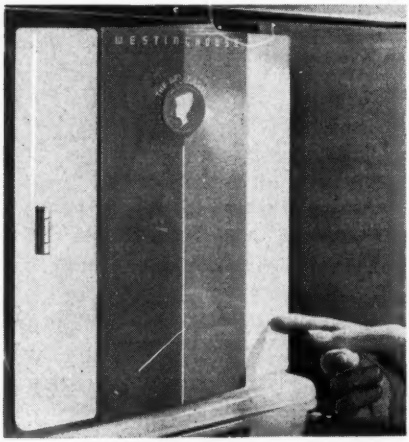
dip galvanizing furnaces has revealed some startling facts, the most important one being that the efficiency is a very elusive thing depending upon many variables. Included in the list might be a tenth factor, namely, whether the production goes through the bath continuously, as for example wire, or whether it is intermittent like pipe, sheets, structural steel, and most other kinds of production.

A fact which appears clearly is the very high efficiency of the electrically heated galvanizing furnace. All other kinds of galvanizing furnaces are far below the efficiency of the electrically heated galvanizing furnaces. This outstanding fact indicates the wide-open field for the improvement in the design and construction of hot-dip galvanizing furnaces using other kinds of fuel. This new furnace design must recognize two basic features that make the electrically heated galvanizing furnace so efficient. These features are —1. No lost heat carried off with flue gases. Electric heat is basically stationary, while the heat from other fuels is fast moving heat with large fuel losses due to waste heat carried up the chimney. 2. The application of electric heat allows a furnace design much like a "fireless cooker;" the same general idea must be used to increase the furnace efficiency for other fuels. The combustion problem involves burning all of the fuel in the immediate vicinity of the galvanizing pot, and at a low enough temperature so that the pot is not destroyed.

A standard practical figure for hot-dip galvanizing one ton of steel may be taken as 344,915 B.t.u's during actual galvanizing operations; a standard total figure which also includes the melting up of the zinc required for the ton of steel galvanized is 375,000 B.t.u's per ton of product galvanized.

"Zinc in War" is the title of a four-page folder prepared for distribution by The New Jersey Zinc Company, 160 Front St., New York, N. Y., describing and illustrating the use of zinc in the manufacture of fire hose, sprayed metal, U. S. Army "Jeep" Cars, tanks, army communications equipment, machine tools, ordnance brass for cartridge and shell cases, fuse parts, and so on. Copy free upon request.



Porcelain enameled steel instead of aluminum is now being used in the manufacture of ice-cube compartment doors for Westinghouse refrigerators. The plastic center portion located between the enameled steel strips will remain the same.

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How to speed up the cleaning of metal parts—do a thorough cleaning job—and at the same time cut down man-hour costs—is a problem faced today by many manufacturers, who must keep war production rolling through. The built-to-the-job metal cleaning equipment, illustrated above, solved just such a problem for a large automobile manufacturer engaged in the production of airplane engine parts. If you have a similar problem, the extensive experience of Mahon engineers can be applied to advantage in bringing about a quick and economical solution in your metal cleaning operations. Put this specialized knowledge to work for you without further delay. There is no cost for consultation.

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"We'll Take Infra-Red"

The author reviews a practical experience which may help those interested in infra-red treatment of finishes.

By V. W. HEGGIE, Vice President
Anchor Post Fence Co., Baltimore, Md.

FROM our company's beginning in 1892 up to 1923 the question of metal finishing did not confront us with any problems of a particularly knotty nature. True, we kept abreast of our industry but the application of molten zinc to a metal product was pretty well standardized and our technicians got along very nicely.

In 1928, however, troubles galore made themselves comfortable on our door step because we began the manufacture of oil burners for domestic use, and our knowledge of galvanizing had no place in the finishing of the new product. We had no skilled painters, no spray equipment and no drying facilities. The first two problems were solved by hire and purchase. The third problem was a little tougher but the use of a crackle lacquer that air-dried dust-free in 30

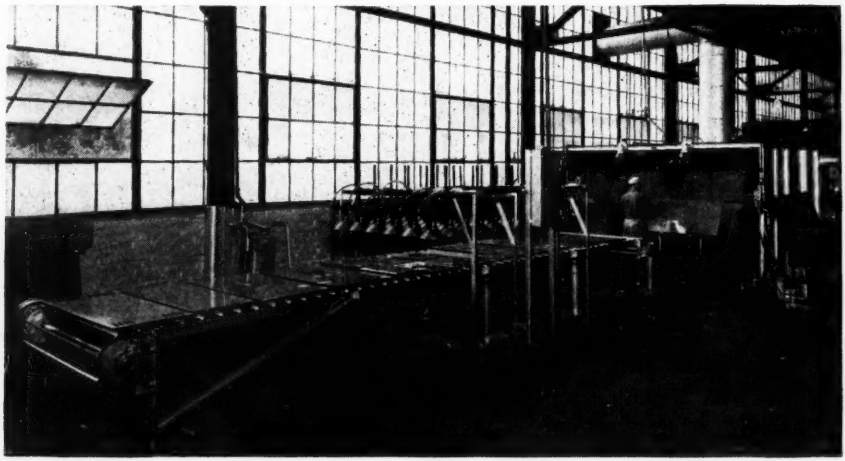

Fig. 1—A general view of the spray booth and conveyor used by the Anchor Post Fence Company in the infra-red treatment of finishes for heating equipment.

minutes and hard in an hour and a half was found to be the answer.

For several years we had satisfactory results with this finish. The color range was limited to black and until dealers and customers became color conscious we got along quite well. A year or so ago the demand for a more durable and colorful finish became actute because of public desire plus the fact that we were about to broaden our activities to include the manufacture of metal cabinets for enclosing our Fluid Heat line of boilers and air conditioning furnaces.

Now, new problems presented themselves. We had to find a way to finish panels of 20 gauge automobile body steel fast enough to make quantity production possible without taking up valuable production space. The first idea that we had, embraced the use of our own oil burners in an oil fired baking oven, but this, while it would salve our pride would not solve our problem.

In the midst of our dilemma Master Mechanic Stanley Pivonski was browsing through some trade publications when he saw an article on Ford's original clam shell infra-red unit. He reasoned that if it could be done on the curved surface of automobile bodies it should work all right on the flat surfaces of air conditioner jackets particularly when the material was identical in both cases. Because the process was comparatively unknown, the management was skeptical but Mr. Pivonski and John S. Case, Assistant Chief Oil Burner Engineer, were successful in selling the idea.

The result of this discovery and subsequent investigation, is that now Fluid Heat air-conditioner and boiler jackets are finished under the rays of infra-red lamps. More recently we started using our infra-red equipment in the finishing of the oil burners themselves.

Our equipment consists of a DeVilbiss spray booth, Link-Belt conveyor and battery of infra-red lamps. The spray booth has working space for two operators and is so well ventilated that masks are unnecessary. The conveyor table is 30 feet long with a 7-foot loading space and a 12-foot cooling space. It is of the variable speed type thus permitting adjustments necessary in finishing articles of sheet, plate or castings.

Fig. 2—A "worm's-eye" view of a segment of the infra-red lamps arranged for the baking of flat workpieces.

The dryer itself occupies 11 feet of the conveyor length. It is composed of ninety-six 260-watt infra-red lamps set twelve to a row. The battery is wired in units of six and each unit is individually controlled. This makes possible the selection of the correct number of lamps required for the work in process. The importance of this is indicated by the fact that all ninety-six lamps will overbake 20-gauge sheet and discolor the finish at a conveyor speed of eight feet per minute, which is the maximum at which our equipment will operate. However, we use same conveyor

speed, turn off twenty-four lamps, and get a finish as fair and free from blemish as milady's complexion.

When finishing Fluid Heat oil burners, which are built from steel plate plus a few small castings, all ninety-six lamps are turned on and the conveyor speed is reduced to one foot in three minutes. This leisurely ride under the lamps allows sufficient time for the heavier metal to come up to the proper temperature for thorough baking. Burners are baked completely assembled except for a sheet metal pump cover which is finished in quantity under fewer lamps and at higher conveyor speed. As each burner reaches the end of the conveyor it trips a bell switch that brings workmen who remove the burner and then proceed with their packing until the bell announces that another burner is ready for attention.

Our lamp set-up is such that the entire battery can be arranged in tunnel form when burners or other objects having appreciable height are to be finished, or with all lamps facing downward for flat objects. Each lamp is set in a gold plated focusing reflector and each receptacle is adjustable at the proper point. These reflectors are cleaned once a month by wiping with soft cloths dipped in enamel thinner and lamp black. We prefer this to caustic soda dip because it makes it unnecessary to remove reflectors when cleaning, thus saving time and labor, and avoiding lamp breakage.

The material which we use in finishing our merchandise is a product of organic chemistry known commercially as Polymerin. The first coat is a solid color which is given a mottled or "hammered" appearance by immediate spraying with spatter solvent. When placed under the lamps, the infra-red rays heat the coating and the metal underneath. The heat acts as a catalyst which changes the simple molecular construction of the fluid coating to a complex construction in which the molecules are larger and overlap each other. Through the action of the infra-red rays the finish is dried thoroughly.

In our attempts to further improve the efficiency of our infra-red dryer we have tried many different things, some of which worked and some didn't. One idea that proved singularly successful was the placing of a flat reflective baffle underneath the conveyor where it passes under the lamps. This serves the double purpose of shutting out drafts and reflecting some of the rays back to the product being finished. The effect is noted particularly when finishing burners or other objects which approximate the shape of the tunnel itself. Installation of this baffle increased our baking temperature 60 degrees and provides a harder, more durable and lustrous finish with no increase in current consumption.

Figuring every factor — cost of equipment, floor space, production requirements, ease of handling, durability of finish, and beauty of product— **"we'll take infra-red."**

"Sheet Lighting" for the Blackout. The Continental Lithograph Corp., 952 E. 72nd St., Cleveland, Ohio, is now issuing an illustrated brochure entitled "Conti-Glo P-10 for Seeing in the Blackout" which gives an instructive presentation of the many uses for the Conti-Glo phosphorescent sheeting in providing light for the safe movement of workers in the plant. It contains also a discussion of the relative advantages of phosphorescent paint and phosphorescent sheeting, with specifications on Conti-Glo phosphorescent paint, and—for those who find it absolutely necessary to use phosphorescent paint—outlines certain precautions that must be observed if effective results are to be obtained.

The brochure includes a sample of Conti-Glo P-10 with which its light-storage and light-giving properties may be demonstrated. This sample is available only to those who make their request on their company letterhead.

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Diesel Powered Metal Finishing Plant

This article tells how Diesel equipment can provide economical, dependable, and abundant power for the finishing plant or department

By FRANCIS A. WESTBROOK

THE New Method Plating and Enameling Company, Worcester, Massachusetts, has installed Diesel power equipment which this company estimates has cut its power cost to approximately one-third the cost of purchased power. The manner in which this has been worked out as a matter of practical engineering will be apparent from the discussion which follows.

This company engages in finishing operations such as electroplating, painting, and enameling. They have the usual complement of metal finishing equipment consisting of plating tanks and barrels, a low voltage plating generator, cleaning and polishing machines, and a sand blasting unit. In the plating and enameling department, pneumatic equipment is operated by an air compressor and exhaust fans are provided in the painting room. The Diesel engines shown in Fig. 1 provide all the necessary power to operate all this equipment.

The two Diesel engines shown in this illustration are located in the engine room at one end of the building. These two engines are arranged so that they can both be connected to the same jackshaft. This arrangement provides a compound drive which is said to be very practical, thus easy and simple adjustments can be made which make it impossible for either engine to carry too much of the load requirements. In other words, governors provided on each unit are adjusted to function in such a manner so as to divide the load between the two engines practically in proportion to the respective engine ratings.

The jackshaft is connected by means of a belt drive to a compressor which provides air for the pneumatic equipment in the painting room and also for the sand blasting equipment. Another belt drive from the same jackshaft operates a 10 kw., 115 volt, single phase generator which furnishes power for lighting and a few small motors distributed around the plant. Control of the power equipment is easily accessible at a switchboard which is located in the engine room.

Practically all of the plating and polishing equipment is driven from three line shafts which are located in the main plant. These line shafts are arranged in the main section of the

plant in such a manner as to serve the entire space. However, the small exhaust fans in both the paint room and the plating room blowers are driven by individual motors. A steam boiler which is used for general heating purposes and for the supply of hot water for process work requires an oil burner unit and this, too, is equipped with a motor.

An important item in the economy of Diesel power is found in the cooling system of the two Diesel engines. This cooling system can be connected to the boiler in the wintertime for use in heating the shop. Blower type fans are used to force air through the radiators of the Diesel engines, thus providing additional warmth to the engine room. In summertime, however, this warm air is directed to the outside.

The power arrangement provided at the New Method Plating and Enameling Company is practical for this type of shop. In the first place, when it is practical to apply the power of the Diesel engines directly to a shaft rather than first to an electrical generator and then through numerous motors, a considerable saving is effected. That is, losses in both generators and motors, as well as the distribution of wiring are avoided. The sum of these losses, however, must be balanced against the shafting losses. The latter, of course, cannot be considered of much consequence because if motors were used, a belt drive would undoubtedly still be used. The generator takes care of those losses where it is more efficient to provide fractional horsepower motors for the drives. This provides for those drives where the power to be transmitted is so small that it would

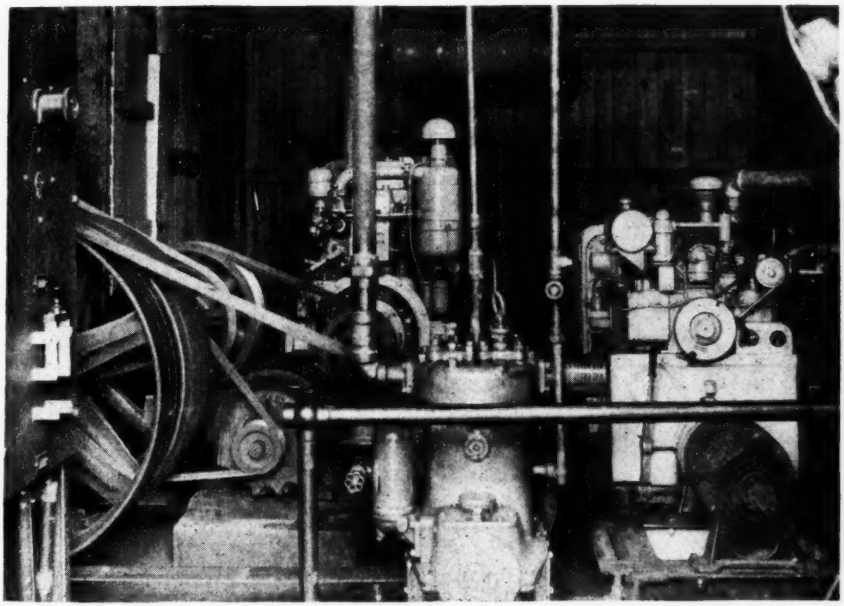

Fig. 1—Illustration showing the two Diesel engine hook-up. A switchboard for controlling the power distribution is located at the left.

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hardly be practical to handle them by belting from the shafts.

Taking everything into consideration, it is estimated by the owners of the business that the cost for power is only one-third of what it would be if purchased and that the Diesel equipment will pay for itself in about three years of operation.

Two Diesel engines have been installed to provide for the possibility of plant expansion in the future. One of the engines is a 30 h.p. unit and was part of the original installation. At first, this unit carried the load adequately until due to an increased demand for power a 10 kw. generator was added. The second Diesel engine has a 60 h.p. capacity and after the installation of this unit, the smaller one has been reserved for stand-by service. The new 60 h.p. equipment is usually sufficient to carry the entire power load adequately. At times of light load requirement, however, the small unit is operated. Under ordinary operating conditions the belt from the smaller engine is taken off the main drive shaft but, as previously pointed out, the hook-up is such that both engines may be operated simultaneously and each will carry its proper portion of the load. The present arrangement provides for future expansion when the larger engine will not be capable of carrying the power requirement for the entire plant.

Mid-West Coated Abrasive Products Catalog No. 22. Mid-West Abrasive Company, 2189 Beaufait Ave., Detroit, Mich., is now distributing a 32-page catalog containing complete information, including list prices, on its line of coated abrasive products, which includes various types of belts, discs, rolls, sheets, reams, and so on.

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The DURIRON COMPANY, Inc.
DAYTON, OHIO

Relieving a "Bottleneck" In Solvents

In this article the author points out that savings can be made by the reclamation of solvents that would otherwise be wasted

By RAYMOND S. ANDERSON

WHETHER a plant is 100 per cent engaged in defense work and has a low priority rating or is producing nothing but non-defense materials, the purchasing agent for that plant is generally experiencing considerable difficulty in obtaining solvents. The solvents such as, acetone, toluol, ethyl acetate, alcohol, trichlorethylene, carbon tetrachloride, and so on—mostly used in finishing operations including cleaning, stripping, and degreasing—are the ones for which there is the largest unsatisfied demand.

In some cases where the regular dealers cannot furnish the solvents, the situation is so bad that manufacturers are paying as high as three and four times the market value in order to obtain the material from any available source. Even though a purchasing agent can place the order at a reasonable price, he still is unable to obtain delivery, and material on order is not of much use to a plant that needs the solvent at once.

To a very large extent this particular bottleneck is unnecessary. Hundreds of thousands of gallons of the solvents above referred to are being wasted daily. Any manufacturer who uses thinner and solvents for washing, stripping, and degreasing operations and who does not save the dirty sludge resulting from such operation and have the solvents recovered from that sludge is to some extent responsible for this shortage.

In these days, a manufacturer who permits such a waste not only is neglecting a very definite chance to cut costs but is contributing to the difficulties of other manufacturers. Many small manufacturers and some large ones engaged in non-defense work are finding the lack of thinners and solvents so serious that they will have to close their plants.

The failure on the part of many plants to relieve this situation by having their wash solvents recovered is mainly due to the fact that this matter has not been called to their attention. For years the lacquer concerns and some of the larger manufacturers using wash thinner and solvents have taken advantage of the very large savings made possible by having the solvents recovered from their sludge. But it is only for a comparatively short time that the smaller users of wash thinners and solvents have realized that this saving was also possible for them through utilizing the services of concerns whose entire business consist in the recovery of solvents.

An outstanding example of a sav-

ing that to a large extent has been neglected is that obtained by recovering the trichlorethylene and carbon tetrachloride from the sludge removed periodically when cleaning out degreasing machines. Most users consider that sludge as entirely useless and send it to the dumps, but I have seen as high as 50 per cent of solvent recovered. The average recovery is much less than that percentage, but I have never encountered any that did not produce at least 15 per cent of solvent. The percentage of solvents recovered from wash thinners is, of course, very much higher, running in some cases to as much as 90 and even 93 per cent.

The recovered solvents are in general water white, neutral, dry, and for many purposes comparable with the original thinner. The cost is only a fraction of that of new thinner, and most important of all is the fact that the recovered solvents can be returned to the manufacturer within about ten days of receipt of the dirty sludge at the plant where the recovery operations are performed.

At the present time, thousands of gallons are being recovered every day, but this quantity can be increased many many times if all manufacturers using solvents for washing, cleaning, stripping, and degreasing would take advantage of the savings involved in having the solvents recovered from their dirty sludge. By so doing they would definitely help to open up the bottleneck that now exists in the solvents market. Furthermore, the opening up of the bottleneck in solvents would be a definite contribution to national defense and the keeping of many small nondefense industries in business.

This is certainly one instance whereby we in industry cannot only help others, but at the same time help ourselves and make a still further contribution to our National defense effort.

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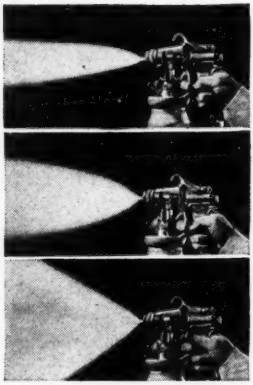

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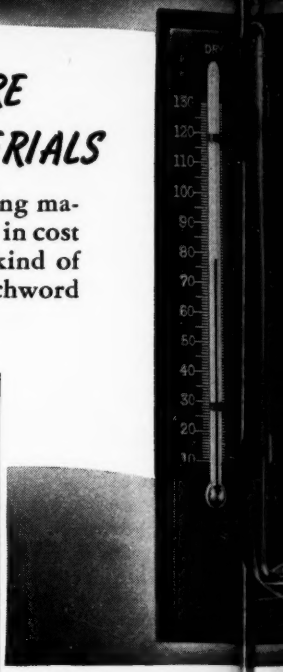
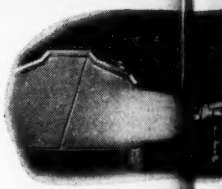
▶ These photographs were all taken with the spray gun operating under the same air pressures and with the same nozzle adjustment. The variations in fan width and behavior of the finish are due solely to the different temperatures of the finishing materials being applied.





3. SOMETIMES

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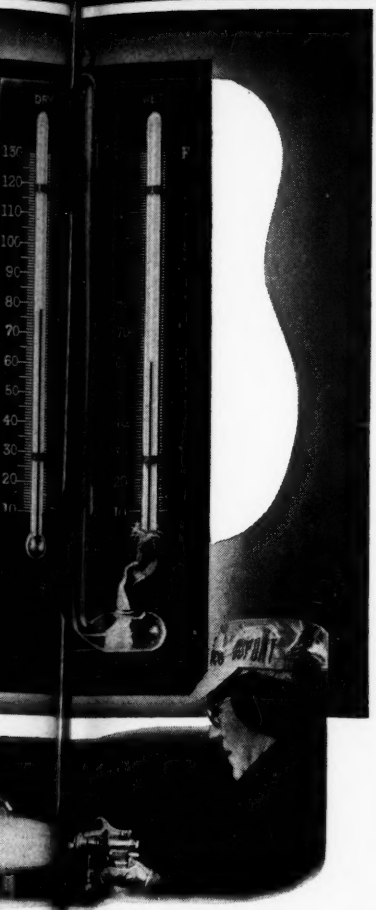

CHECK THESE 11 POINTS TO SAVE MATERIALS

NEXT MONTH READ ABOUT

1. Temperature of paint
2. Viscosity of paint
3. Air and fluid pressures
4. Adjustment of spray gun
5. Handling of spray gun
6. Triggering of the gun
7. System in the strokes
8. Uniformity of coating
9. Thickness of film
10. Causes of rejects
11. Touch-up procedure

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Look for a detailed discussion of each point in a monthly series to follow

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Modern Gold Plating

JOSEPH B. KUSHNER, CH.E.
Metal Finishing Consultant
New York City

AT a talk on gold plating we had the pleasure of delivering to the Newark Branch of the American Electroplaters' Society a short while ago, a question came up regarding the best method for recovering gold from spent plating solutions and dragout tanks. The same question has been asked of us many times and for this reason we are going to devote some space to it.

The problem of recovering gold from its solutions is fundamentally a simple one. Gold, as has been pointed out in this series from time to time, prefers its own company whenever possible and it will precipitate out of almost any solution if given half a chance, while other less electropositive metals remain behind in dissolved state. This fits in neatly with the basic premise of recovery: separation of the metal from all other substances.

Gold can be precipitated from its solutions by either (1) Heat, (2) Chemical Action, (3) Electrodeposition. We shall consider all three methods.

Heat

The heat method is probably the oldest used. In the old days, gold solutions that had finished their useful life were boiled and evaporated down to dryness after which all the dried salts that had not spattered away were scraped out of the pot or dish and placed in crucible with a flux containing borax and litharge and then subjected to blow torch heat. After a while, the volatile and decomposable anions such as carbonates and cyanides would be destroyed completely leaving behind a small button of gold and lead floating in a slag of molten flux. The gold, generally not of a very high degree of purity, particularly if other metals were present in the solution, was then sent to the refiner for credit or was cut down once again to be used for plating purposes.

The method described above which is still practiced to some extent, is tedious to say the least, and there is considerable opportunity for gold losses by spattering during evaporation. Except for use by some old time platers and in small jewelry houses, it is rapidly becoming outmoded.

Precipitation by Chemical Action

A number of reagents both inorganic and organic, will directly pre-

Part 18

cipitate gold from its solutions. As a matter of fact, it may be said in general that all reducing agents will precipitate gold from its solutions under given conditions of pH. The following substances will precipitate gold under varying environments: Citrates, tartrates, acetates, thiosulphates, sulfites, gallates, tannates, nitrites, mercurous salts, zinc, formaldehyde, ferrous salts, oxalates and aluminum and carbon, just to mention a few. Unfortunately, most of these reducing agents work only in acid solution, and most of them are expensive to use. However, some are inexpensive and work well even in alkaline solutions. A reagent that works well in acid solutions is ferrous sulphate and this is the basis of the acid method of precipitation.

In the gold electroplating industry the common practice in recovering gold from spent solutions has been to convert the cyanide solution to chloride form and then precipitate the gold with ferrous sulphate. Such methods are given by Hoke* and have been given in various other publications. The general idea is to treat the gold cyanide solution with hydrochloric acid to convert the cyanide to chloride and then follow by treating the chloride solution with $FeSO_4$.

This acid process has a number of drawbacks. First, a large quantity of acid is consumed in neutralizing the carbonates, hydroxides and alkaline reacting salts that are present before it can go to work on the cyanides. Second, excellent ventilation facilities must be available because of the toxic fumes of prussic acid (HCN) that are liberated during the recation. This is probably the main drawback to the process.

The third drawback is that some of the gold may be lost because of the formation of a colloidal phase. Hydrochloric acid is a non-oxidizing acid, so it will not completely destroy the cyanide present in the solution unless vigorous boiling is resorted to. Some platers think that once a cyanide solution has been acidified with hydrochloric acid the cyanide has been "killed." This, at room temperatures or slightly above, is not the case. A considerable amount of cyanide remains in the solution in the form of redissolved prussic acid, that cannot be driven off, unless vigorous boiling is resorted to. As a matter of fact, we might mention at this point that there is a successful commercial method for gold plating stainless steel that makes use of a solution that contains both cyanide and hydrochloric acid.*

If the cyanide is not completely destroyed on the addition of ferrous sulphate, all the gold is not completely precipitated in filterable form. Invariably, a small quantity of gold is left in the colloidal state, the presence of the cyanide acting to restrain the growth of the gold crystals to such an extent that some of them will not grow past the colloidal stage into the massive form. As a matter of fact, in extreme cases some of the gold is not even precipitated, it is held so tightly by the cyanide and ferrocyanide formed on addition of ferrous sulphate.

If the acid method is to be used at all, it is a good policy to treat the

* *Hoke, "Refining Precious Metals."*

* *To be discussed in another article.*

cyanide solution with hydrochloric acid plus a little oxidizing agent such as potassium chlorate or sodium hypochlorite, or even hydrogen peroxide, and boil. This insures complete destruction of the cyanide prior to precipitation with ferrous sulphate or whatever reducing agent is used. In this case, excess ferrous sulphate or reducing agent must be used to insure complete precipitation as some of the ferrous sulphate will be destroyed by the oxidizing agent, if any is present, after boiling.

Many platers still use this acid method but an equal number have given it up and send their solutions to the gold refiner direct, in order to avoid the poisonous and disagreeable odors that arise when the cyanide solution is treated with acid.

We have argued for years that an example could very well be taken by the plater from the gold mining industry when it comes to recovering gold from cyanide solutions. In the gold mining industry, they precipitate gold from a weak cyanide solution in which the gold concentration is quite low, without resorting to the use of acids. The cyanide in the solution is preserved and used over and over again. We experimented with the method and found a long time ago that it could be very nicely applied to the recovery of gold from plating solutions. It is really surprising how few gold platers take advantage of it.

Zinc Precipitation Method

The precipitation method with the least amount of fuss and fumes is the zinc - alkaline precipitation method, the one used in the gold mining industry. If zinc metal is placed in an alkaline cyanide solution of gold containing sufficient free cyanide, zinc goes into solution and displaces the gold which precipitates out in the form of a blackish brown powder. The reaction that takes place is the following:

$$2NaAu(CN)_2 + 4NaCH + 2Zn + 2H_2O = 2Na_2Zn(CN)_4 + 2AU + H_2 + 2NaOH$$

Aluminum as well as activated charcoal can be used for precipitating the gold from the alkaline cyanide solution. But aluminum is out of the question for this use at present and activated carbon is a messy substance to handle so zinc remains the best bet.

In precipitating gold from a spent plating solution by the zinc method it is essential that there be sufficient free cyanide present. This is the first basic rule. If insufficient free cyanide is present, little or no gold precipitates. Instead, a white precipitate forms that literally gums up the works. This precipitate consists of zinc hydroxide, zinc cyanide and zinc ferrocyanide, where iron is in the solution, and perhaps other basic zinc compounds and it coats over the free zinc and prevents it from dissolving. With sufficient free cyanide present, these compounds are dissolved as rapidly as they form thus permitting the zinc to dissolve and displace the gold from the double cyanide. As a further aid, the presence of some free caustic soda is also helpful.

The second basic principle is to use clean zinc in sufficiently divided form. Oxidized and dirty zinc surfaces are much slower in going into solution and thus retard the reaction, while large pieces of zinc such as slab zinc or chunks do not offer enough surface area on which the reaction can take place. The most satisfactory form of zinc to use is zinc dust; feathered zinc is not as good.

In connection with the idea of surface area and chemical activity it is of interest to digress for a moment and demonstrate the way surface area varies with size. Let us assume

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we have a cube of zinc one inch on a side, for example, one cubic inch. The total surface area of the cube is 6 square inches. Now let us break up the cube into ten equal cubes each having a volume of .1 cubic inch. The total surface area becomes 27.8 sq. inches, an increase in area of approximately five times. If we were to subdivide our one inch cube into 1,000 equal parts each containing .001 cubic inch, the total surface area would now become 600 sq. inches, an increase in surface area of 100 times. Since the precipitation reaction takes place at the surfaces available, it is easy to see why zinc dust is better than slab zinc as a precipitant.

It is also important to see that sufficient zinc is used. According to the equation given previously about .17 ounces of zinc are required to precipitate 1 ounce of gold but in actual practice it may be necessary to use between three and four times this amount and possibly more, to completely precipitate the gold. The amount of zinc that is used up for a given weight of gold depends to a large extent on the amount of free cyanide present and the presence of other metals.

Another point, though of lesser importance, is to have a fairly clear solution to start with. If the gold bearing solution is very turbid with suspended matter it is recommended that the solution be filtered prior to precipitation. In most cases however, this step is not needed.

The actual procedure of the method will be something as follows:

Put all spent or worn plating solutions together in a covered stone crock. Take a free cyanide test. The free cyanide content should be at least 1-2 oz. per gallon. Now roughly approximate the gold content of the solution. Assume that you, for example, estimate you have about .1 oz. of gold present in a total of 20 gallons. Pour into the solution with constant stirring a minimum of 1 oz. of zinc dust. Follow at once with a ¼ oz. of lead acetate and a ½ oz. of sodium sulfite, stirring continuously as you add these salts.

The purpose of the soluble lead salt is to speed up the reaction. What happens is that some of the lead precipitates on the zinc forming what is called a galvanic "couple," a joining of a more electropositive metal with one less electropositive, which causes the zinc to dissolve more rapidly under the influence of electrolytic action as well as the regular chemical action and results in the actual plating out of the gold on the cathodic metal (lead).

The purpose of the sodium sulfite is to help maintain reducing conditions in the solution. The precipitation of gold is a reduction and it is therefore aided by the absence of oxygen. The sulfite, a reducing agent in itself, helps keep under control any oxygen present in the solution.

After adding the sodium sulfite, the cover is placed on the crock and the solution is left to stand for approximately four hours. A darkish brown precipitate will appear after this period of time has elapsed on the bottom of the crock. If the solution is completely settled, syphon off the clear supernatent liquid. When performed properly this liquid contains only traces of gold and can be discarded down the drain. Filter the precipitate on strong paper and wash it well several times with hot water. Finally, using the wash bottle technique wash the precipitate into a glass beaker of suitable size. The precipitate which is a mixture of zinc, lead, gold and silver, if present, is now treated to an acid bath to dissolve out most of the zinc and lead.

Dilute nitric acid is slowly added to the precipitate as it is heated over a gentle flame until no further action

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occurs. The mixture is permitted to settle and then the clear supernatent liquid is poured off. The precipitate is then washed by decantation several times to remove the last traces of soluble salts. The precipitate can now be dissolved in aqua regia and the gold precipitated by ammonia to form the fulminate, as explained in Part I of this series, and used to replenish the gold baths. Otherwise, the precipitate is dried out and mixed with some flux containing borax and niter and melted down in a clay or carbon crucible to give a gold button of a fairly high degree of purity (.900-.950 fine).

If no hood is available for removing the fumes of nitric oxide formed in treating the precipitate with nitric acid, then the next best method is to use sulphuric acid instead. This will leave quite a bit of lead in the precipitate and reduce the fineness of the resulting gold button somewhat but at the same time, the lead present acts as a scavenger, collecting every last bit of gold in the mix, and helps get a cleaner melt.

Electrolytic Precipitation

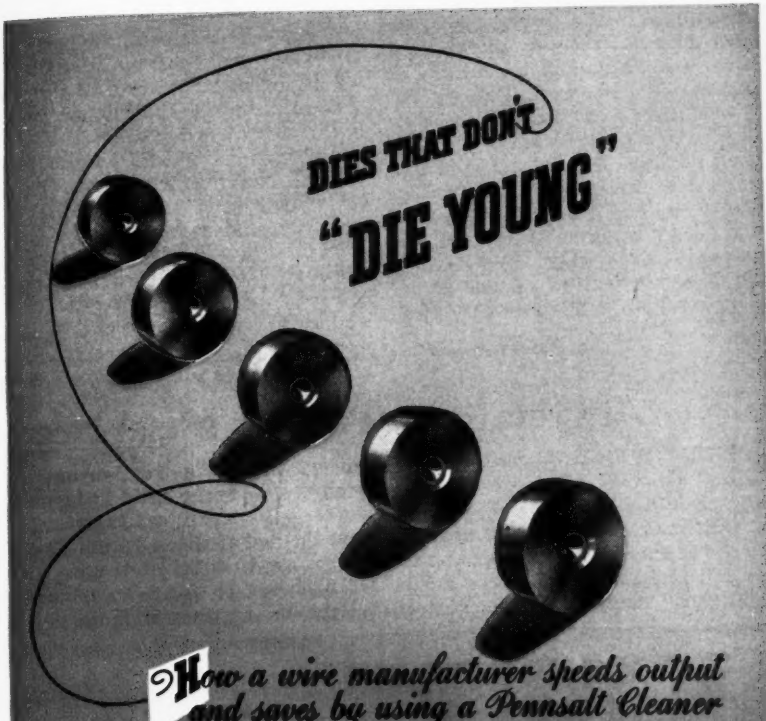
Another method for reclaiming gold from solutions is by means of electrolysis. The spent gold solutions are placed in a crock connected as a plating tank. The cathodes may be made of copper or brass and the anodes can be either stainless steel, iron or carbon. The cathodes should be bagged to aid in retaining any particles of gold that may drop off. The free cyanide content should be held around ½ oz. per gallon. The solution is electrolyzed at 6 volts and enough current is passed to more than plate out all the gold present. Thus for example, if we estimate that .25 oz. of gold are present in the solution, it will take, theoretically about one ampere hour of current to deposit this gold. If our current is 4 amperes it will take only 15 minutes to do it. Allowing for a safety factor of 2-4 we pass the current for 30 minutes to 1 hour, to insure as nearly complete removal as possible.

The only hitch with this method is that all the gold cannot be completely cleaned out of the solution. Invariably, a small percentage is retained so powerfully by the cyanide that the electric current cannot split it apart. Much more complete separation is obtained in the acid gold solution (chloride). But this again involves treatment of cyanide with acid so it does not pay to do this where small amounts of gold are involved. The amount of gold retained by the cyanide solution usually runs between .01 and .02 oz. per gallon.

In connection with recovery of gold by electrolysis, a method for treating gold plating solution dragout this way was recommended a short while back in a paper by F. K. Savage.

He makes use of a central recovery rinse tank that is arranged as a plating tank with bagged brass cathodes and carbon anodes. Whenever the generator is on, the recovery plating tank is connected to it and thus any gold that is rinsed into the recovery tank is plated out and saved. In his own words: "Considerable quantity of gold is recovered yearly in this way without the necessity of a great deal of space taken up by a system of dragout tanks and concentration tanks."

This seems to be a good method for overcoming dragout losses, which today are more important than ever but it can be pointed out that the method is not ideal. In the first place, if one central electric recovery rinse tank is to be used for a number of gold plating baths it becomes practically impossible to prevent considerable loss through dripping. The recovery tank must always be adjacent to the gold plating bath, if there is to be no loss



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by dripping. In the second place, the system does not recover all the gold. This is best explained by taking an example. Let us assume the electric recovery rinse is 20 gallons and that the average concentration of the gold plating baths is .2 oz. of gold per gallon and that the amount and nature of the work done is such that 1 gallon of the gold plating solution goes into the dragout every day. We have to reach a concentration of .02 oz. of gold per gallon in the recovery tank before gold will start to deposit. This will take place, roughly, at the end of the second day. After the second day, the recovery tank will have this concentration of gold in it and deposition will begin. But from this point on the tank will have an average concentration of .02 oz. of gold per gallon. If this is the case then at the end of the working year (360 days) approximately $210 (300 x .02 x 35) worth of gold will be lost down the drain.

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In conjunction with the "Victory Market Place," the Journal of Commerce now presents each Tuesday a page of case histories explaining how individual manufacturers are actually meeting production, equipment, packaging, and transportation problems arising out of the war. Manufacturers in all branches of industry are cooperating in this effort to publicize ideas that work for general use.

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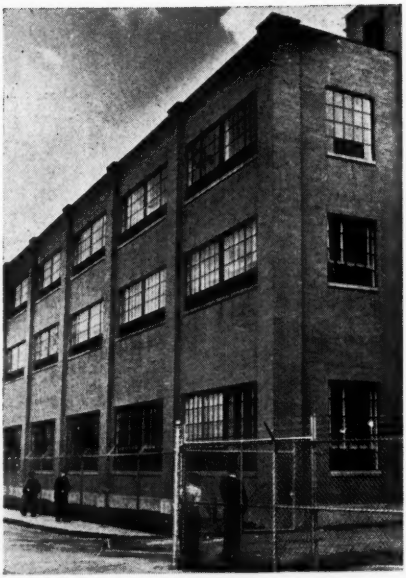

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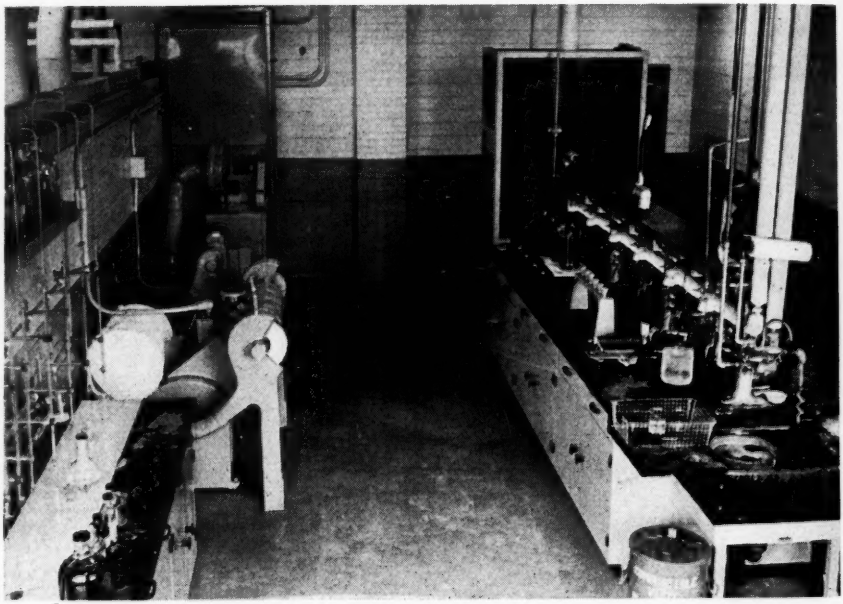

Fig. 1—View showing interior of DuPont's new Niagara Falls research and service laboratory for studying heat treating, case hardening, and electroplating problems.

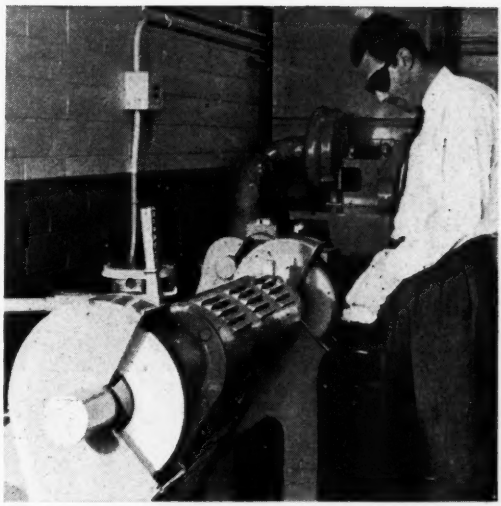

Fig. 2—Preparing a test sample for electroplating. This laboratory is used for service to customers and for the development of new electroplating processes.

conducted by skilled investigators. Such inquiry has in many cases furnished the impetus for expanding the manufacturing facilities of many plants and the consequent enlarging of their scope of activities. In working toward a closer cooperation in providing aid to manufacturers, the E. I. du Pont de Nemours & Company recently announced the opening of its new Cyanide Products Service Laboratory at the Niagara Falls, N. Y., plant of the R. & H. Chemicals Department.

Staffed by chemists, metallurgists, and technical service men, the company reports the new laboratories

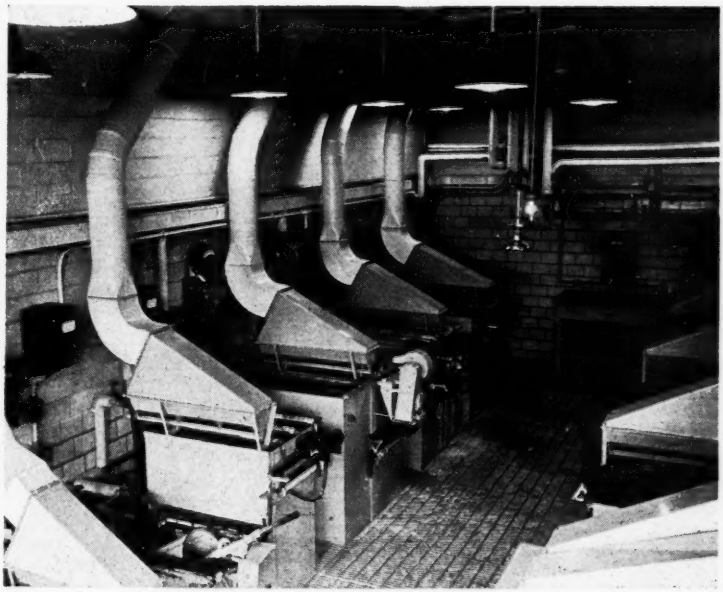

Fig. 3—Electroplating tanks in the service laboratory. This semi-works equipment has been designed to reproduce plant conditions on a small scale.

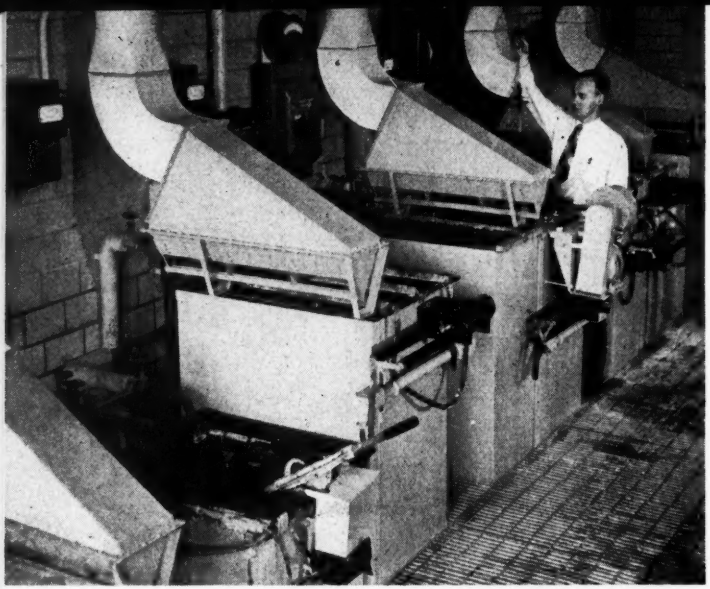

Fig. 4 — Illustration showing a research chemist examining test samples which are being electroplated.

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Every effort is made to duplicate plant operating conditions on a "semi-works" basis in the service laboratories. The electroplating service section is complete with plating tanks, modern filtration and other electroplating equipment.

The metal treatment section has a chemical laboratory to analyze case hardening baths and heat treating compositions as well as treated metals. The metallographic preparation room has equipment for sectioning and polishing metals, and Brinell, will be used primarily for the study and solution of customers' problems and for development of improved metal treatment and electroplating processes.

A three-story brick building houses a cyanide products analytical and research laboratory, a metal treatment furnace room and an electroplating service laboratory. Staff offices, metallographic preparation and photographic rooms and storage space are also provided.

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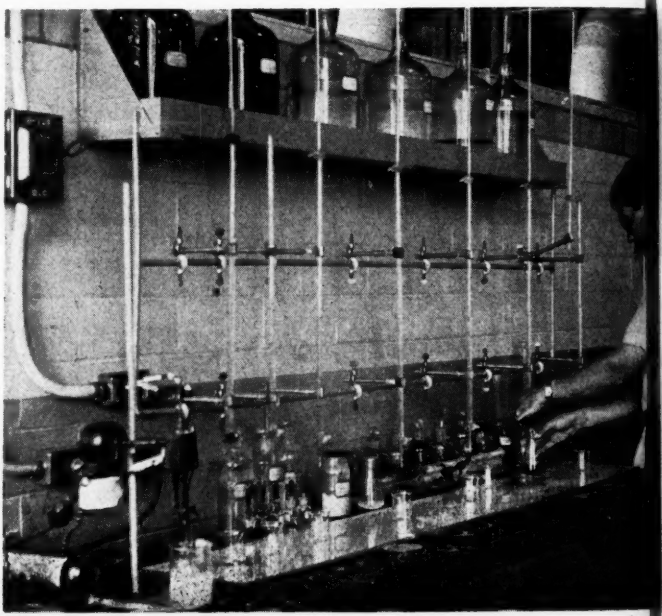


Fig. 5—A view of the plating solution control laboratory. Routine and special analyses are run on electroplating solutions, and research is conducted on simplification of control methods.

Firth Hardometer, Rockwell, Rockwell Superficial, and Scleroscope machines are used to determine the hardness of treated pieces of metal.

Investigation of methods for removal of salts which form on sheet steel during pickling operations is one of the interesting studies continued in the new laboratory. Study of the general problems involved in metal cleaning already has resulted in industrial acceptance of a cyanide neutralizing process for cleaning steel sheets prior to vitreous enameling, bonderizing, or galvanizing.

American-Heanium Long-Lyfe Abrasive Blast Nozzle. A four-page illustrated circular describing the American-Heanium Long-Lyfe Abrasive Blast Nozzle is now being issued by American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind. The nozzle consists of an extremely hard ceramic insert enclosed within an improved abrasion-resisting jacket.

The ceramic insert is the product of years of research in the field of colloidal chemistry. It is claimed to have a density and hardness that is superior to many of the metals now being used for this purpose.

The circular contains an interesting chart showing the amount of compressed air consumed per minute by various sizes of blast nozzles. It also illustrates how the American-Heanium nozzle—through slow orifice enlargement—effects important savings in compressed air and power.

The circular contains prices, specifications, and a complete list of the important features of this new development in the nozzle field. Copies of the circular may be obtained by writing directly to the manufacturer.

"Blackout Twins" is the title of a folder giving timely, up-to-the-minute information on interior and exterior Blackout Cold Water Paints as manufactured by the Tamms Silica Company, 228 N. La Salle St., Chicago, Ill. Copy free upon request.

Mention PRODUCTS FINISHING when writing to advertisers.

Better Buffing at Lower Cost

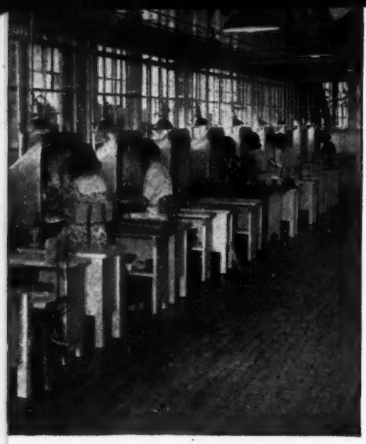
to meet present day demands

Genuine BIAS BUFFS are made to fit into this swift mass production age, insofar as buffing and finishing metals are concerned.

These buffs, made of the best cotton cloth, and constructed by skilled experienced workmen outlast an ordinary buff two to one! And at the same time cost no more than ordinary types in the final analysis.

Investigate the merits of this buff. Try them and prove the claims of BIAS Buffs.

The BIAS BUFF *and* WHEEL CO., Inc.
430 Communipaw Ave. Jersey City, N. J.



News OF THE INDUSTRY

Alvey-Ferguson Increases Production Facilities

A 25 per cent increase in production capacity has been the result of the recent completion of the first unit in a big expansion program, according to John C. Walter, President of The Alvey-Ferguson Company, Cincinnati, Ohio, pioneer manufacturers of Scientifically-Planned Conveyors and Super-Spray Product Washing Machines.

Completed in only four weeks, the new plant is the result of careful preparation and planning, and is modern in every respect; with fluorescent lighting throughout and the latest machinery and testing apparatus for manufacturing and inspection.

New demands for shell and cartridge production, shell loading, gun barrels and other defense items are reported to have caused a heavy demand for especially designed conveying equipment and product washing machines, and The Alvey-Ferguson Company is now preparing a booklet featuring this type of equipment especially for defense work. Those requesting this new booklet are asked to please mention this publication.

Buffalo-Toronto A. E. S. Joint Meeting

A preliminary committee meeting was held recently at Hotel Brock, Niagara Falls, Ont., to prepare for a joint educational session of the Tonoronto and Buffalo Branches of the American Electroplaters' Society.

Mr. John Acheson acted as chairman and a tentative date of Saturday, April 18, 1942, was set for the educational session to be held at the Hotel Brock, Niagara Falls, Ont., with the ladies attending. An invitation was extended to the Rochester Branch to join in this session. The talks will deal with subjects of vital interest today. Dr. C. J. Wernlund, Niagara Falls, is in charge of the educational program.

The program, advertising and tickets for the Canadian side of the border has Mr. John Acheson as chairman, with Allan Byers, W. E. Price, and Arthur Severs assisting. On the American side of the border, W. M. Fotheringham is chairman, with William Hart, Ray Kilroy, and Dr. C. J. Wernlund assisting.

A cordial invitation is extended to A. E. S. members to join in an enjoyable and profitable meeting.

Robert Lewis Appointed Representative for Watson-Standard Company

The Technical Coatings Division of Watson-Standard Company, Pittsburgh, Pa., announces a new Chicago industrial representative—Mr. Robert Lewis, 6 N. Hamlin Ave.; telephone, Van Buren 2800.

It has also been announced that the company's New York City technical representative, Mr. Raymond Swan, has moved from 126 Lexington Ave. to 2 Lafayette St.; telephone, WOrth 2-0415.

Matthews Appointed Cowles Representative

D. Clark Matthews is the new Southern Ohio representative of The Cowles Detergent Company, 7016 Euclid Ave.,

Cleveland, Ohio. He is selling Cowles' complete line of alkaline metal cleaners. Matthews is an electrochemist and

D. Clark Matthews

acquired his early experience in the field as an electroplater. More recently, he has become well-known as a technical consultant on metal working and finishing processes.

Oakite Expands Service Facilities to Help Meet War Production Demands

To better meet the rapidly increased needs for its services and products by metal working plants located in New England and the Southwest, Oakite Products, Inc., manufacturer of industrial cleaning materials since 1909, has announced the addition of two newly created divisions to its nation-wide field service staff. Today, as in 1914-1918, the Oakite organization is being called upon to render service on cleaning and related operations in plants being converted from the manufacture of peacetime products to the production of essential war supplies. With the establishment of these two new divisions, the company has enlarged the facilities of its service organization so that it is able to serve the metal working industry more effectively than ever before.

The New England Division, with headquarters in Hartford, Conn., at 410 Asylum St., Room 320, Capitol Bldg., is headed by Mr. T. R. Smith, newly appointed division manager, who will supervise the activities of the 11 men comprising this division. Having served

CLEAN 'EM FASTER *with* RANSOHOFF *Equipment*

Complete equipment for cutting down, pickling, cleaning and drying, either separately or in combination.

We have built and are building equipment for the above processes on all sizes of cartridge cases, projectiles, machine gun links and Garand clips.

Ransohoff Engineering Representatives located in all principal centers.

WRITE OR WIRE DEPT. "PF" FOR CATALOG OR FURTHER INFORMATION

N. RANSOHOFF, Inc. TOWNSHIP AND BIG FOUR R. R. CINCINNATI, OHIO

for the past 16 years as one of the Oakite service representatives in an Eastern industrial area, where much of his work has been concentrated in the heavy manufacturing and mechanical industries, Smith brings to his new post a wealth of knowledge and experience in the cleaning of metals before inspection, assembly and finishing, as well as

S. C. Shank

T. R. Smith

such related operations as drawing and stamping, cutting and grinding, burnishing and tumbling.

The second new Oakite Division is the St. Louis and Southwestern Division, which will make its headquarters at St. Louis. Mr. S. C. Shank, the Oakite service representative in the Toledo, Ohio, territory since 1930, has been selected to fill the post of division manager and direct the activities of the 12 men comprising this division. Mr. Shank is well qualified to handle his new responsibilities, since he is equipped with a broad business background that combines diversified industrial experience with a specialized knowledge of manufacturing techniques, methods and processes commonly encountered in metal forming, cleaning, finishing and fabricating operations.

While stationed in Toledo, Shank distinguished himself by his outstanding salesmanship and meritorious technical service to concerns not only in the metal working field, but also in such other industries as transportation, petroleum, dairy, and food packing. In 1934 he won the company's Service Cup which is awarded annually to the individual in over 100 men comprising the Oakite Field Service Staff making the best sales and service record. On three other occasions he qualified for the award.

The appointment of Smith and Shank as division managers, which follows the long-established Oakite policy of promoting men "up from the ranks" to executive positions, is well-earned recognition of the exacting knowledge, capacity for hard work, and ability they have shown in helping industrial plants in their respective territories to solve new or unusual cleaning problems efficiently and economically, thus enabling these plants to step up output, conserve materials, eliminate waste, and save time in their production cleaning operations.

Boston A.E.S. to Hold Annual Banquet and Technical Session

The Boston Chapter of the American Electroplaters' Society will hold its Seventh Annual Banquet and Technical Session at the Hotel Statler, Boston, Mass., March 28, 1942.

Mr. Joe Barron heads the committee as general chairman. Those working in co-operation with him are as follows: Financial secretary, Andrew W. Garrett; registration, Charles O. Hardy, Leonard Chesworth, and Andrew W. Garrett; arrangements, Robert Magnuson Edward C. DeLorme, and Willard Durgin; reception, Louis A. Gale and Arthur J. Mintie; program and publicity, Wm. Jones and Louis V. Gagnon; entertainment, Louis Tosi and Arthur W. Collins.

Performance of Milburn Spraying Equipment

"How long will a Milburn needle and nozzle remain in operating condition?" This question has been asked by dozens of prospective spray gun customers, and in order to establish a satisfactory reply, the engineering department of the Alexander Milburn Company, Baltimore, conducted a test.

A type OM gun was equipped with a No. 53 stainless steel nozzle and needle, and then attached to an air motor. A counter was applied, and over a period of 32 days, the gun was operated 817,081 times. At the conclusion of the run, the needle and nozzle were found to be in perfect condition.

So, in the future if this same question is asked of any Milburn representative, he can proudly say "After 817,081 operations your needle and nozzle should still be in perfect condition and, at that rate, it should stand several million more operations."

This company offers a chart showing the various head and nozzle assemblies for all types of materials sprayed by Milburn siphon and pressure-feed guns.

Defense Savings Pay-Roll Allotment Plan

How company heads can help their country, their employees, and themselves

voluntary pay-roll allotment plan

helps workers provide for the future

helps build future buying power

helps defend America today

This is no charity plan. It is a sound business proposition that vitally concerns the present and future welfare of your company, your employees, and yourself.

During the post-war period of readjustment, you may be faced with the unpleasant necessity of turning employees out into a confused and cheerless world. But you, as an employer, can do something *now* to help shape the destinies of your people. Scores of business heads have adopted the Voluntary Pay-roll Allotment Plan as a simple and easy way for every worker in the land to start a *systematic* and *continuous* Defense Bond savings program.

Many benefits . . . present and future. It is more than a sensible step toward reducing the ranks of the post-war needy. It will help spread financial participation in National Defense among all of America's wage earners.

The widespread use of this plan will materially retard inflation. It will "store" part of our pyramiding national income that would otherwise be spent as fast as it's earned, increasing the demand for our diminishing supply of consumer goods.

And don't overlook the immediate benefit . . . money for defense materials, quickly, continuously, *willingly*.

Let's do it the American way! America's talent for working out emergency problems, democratically, is being tested today. As always, we will work it out, without pressure or coercion . . . in that old American way; each businessman strengthening his *own* house; not waiting for his neighbor to do it. That custom has, throughout history, enabled America to get things done *of its own free will*.

In emergencies, America doesn't do things "hit-or-miss." We would get there *eventually* if we just left it to everybody's whim to buy Defense Bonds when they thought of it. But we're a nation of businessmen who understand that the way to get a thing done is to *systematize* the operation. That is why so many employers are getting back of this Voluntary Savings Plan.

Like most efficient systems, it is amazingly simple. All you have to do is offer your employees the convenience of having a fixed sum allotted, from each pay envelope, to the purchase of Defense Bonds. The employer holds these funds in a separate bank account, and delivers a Bond to the employee each time his allotments accumulate to a sufficient amount.

Each employee who chooses to start this savings plan decides for himself the denomination of the Bonds to be purchased and the amount to be allotted from his wages each pay day.

How big does a company have to be? From three employees on up. Size has nothing to do with it. It works equally well in stores, schools, publishing houses, factories, or banks. This whole idea of pay-roll allotment has been evolved by businessmen in cooperation with the Treasury Department. Each organization adopts its own simple, efficient application of the idea in accordance with the needs of its own set-up

No chore at all. The system is so simple that A. T. & T. uses exactly the same easy card system that is being used by hundreds of companies having fewer than 25 employees! It is simple enough to be handled by a check-mark on a card each pay day.

Plenty of help available. Although this is your plan when you put it into effect, the Treasury Department is ready and willing to give you all kinds of help. Local civilian committees in 48 States are set up to have experienced men work with you just as much as you want them to, and no more.

Truly, about all *you* have to do is to indicate your willingness to get your organization started. We will supply most of the necessary material, and no end of help.

The first step is to take a closer look. Sending in the coupon in no way obligates you to install the Plan. It will simply give you a chance to scrutinize the available material and see what other companies are already doing. It will bring you samples of literature explaining the benefits to employees and describing the various denominations of Defense Savings Bonds that can be purchased through the Plan.

Sending the coupon does nothing more than signify that you are anxious to do *something* to help keep your people off relief when defense production sloughs off; *something* to enable *all* wage earners to participate in financing Defense; *something* to provide tomorrow's buying power for your products; *something* to get money *right now* for guns and tanks and planes and ships.

France left it to "hit-or-miss" . . . and *missed*. *Now* is the time for *you* to act! Mail the coupon or write Treasury Department, Section A, 709 Twelfth St. NW., Washington, D. C.

FREE - NO OBLIGATION

Treasury Department, Section A,
709 Twelfth St. NW., Washington, D. C.

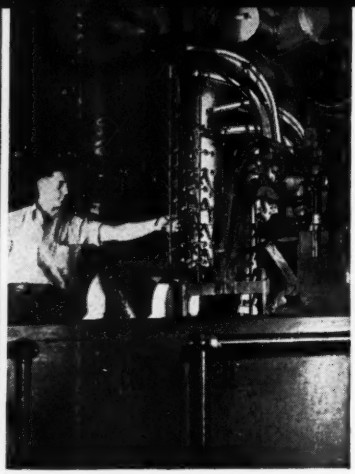
Please send me the free kit of material being used by companies that have installed the Voluntary Defense Savings Pay-Roll Allotment Plan.

Name _____

Position _____

Company _____

Address _____



New PLANT EQUIPMENT AND Materials

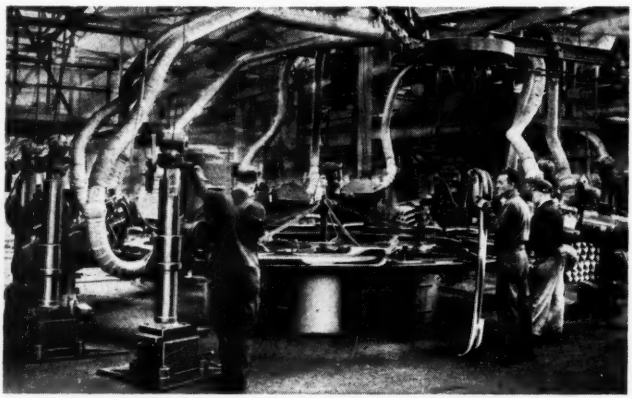
Acme Bumper Buffing Machine

Acme Manufacturing Company, 1642 Howard St., Detroit, Mich., has developed and placed on the market a new bumper finishing machine which is said to reduce both time and cost of processing. The machine is a continuous rotary type, of a construction that Acme Manufacturing Company has advocated to handle more efficiently the finishing of curved bumpers.

Inasmuch as the bumper travels in an arc conforming approximately to the radius of the work, the buffing wheel follows the shape naturally and is said to cover surface by assisting the flexible floating wheel.

The Acme Bumper Buffing Machine has a working table 18 ft. in diameter with nine adjustable toggle type holding fixtures. It is equipped with a variable speed control with an 8 ft. 3 in. pitch gear driven by an 8 in. pinion which is said to positively eliminate back-lash which might cause hesitation marks in the work.

The Acme Bumper Buffing Machine is equipped with 10 buffing heads around the table, each completely adjustable with an adjustable floating spindle equipped with a 15 h.p. totally enclosed fan-cooled ball bearing motor. The motor is equipped with a V-belt drive for selected wheel speed. The wheel spindles are raised and lowered by means of a ½ h.p. V-belt motor drive mounted on the column. This method of mounting is said to permit quick wheel change and re-set. The heads are of heavy cast iron construction, each weighing over 2,000 lbs., thus giving them real rigidity and smooth operation. These heads can normally be equipped with either 15 h.p. or 20 h.p. motors.



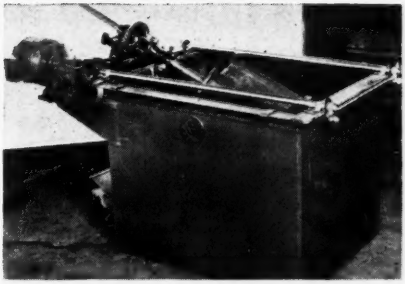
Acme Bumper Buffing Machine

Hanson-Van Winkle-Munning Motor Driven Oblique Plating Barrel

A new and improved oblique plating barrel drive has been developed by the Hanson - Van Winkle - Munning Co., Matawan, N. J., manufacturer of electroplating equipment and supplies. This type is known as the 34 oblique barrel and is now available in a new model, directly driven by 1/6 h.p. motorized worm gear reducer which is suitably mounted on the tank, ready for connection to the user's power lines. The arrangement readily permits the removal of the cylinder for rinsing, loading, and unloading of the work.

The Hanson-Van Winkle-Munning Motor Driven Oblique Plating Barrel can be furnished with a wooden tank, asphalt lined; or a steel tank, unlined or lined with $\frac{3}{16}$ in. vulcanized rubber. The cylinder is all of bakelite construction with disc or button type contacts; or of hard rubber with disc type contact only. The panels in the bakelite cylinder are $\frac{1}{8}$ in. thick; in the hard rubber cylinder, $\frac{1}{4}$ in. thick. This unit will handle about 25 lbs. of work per batch.

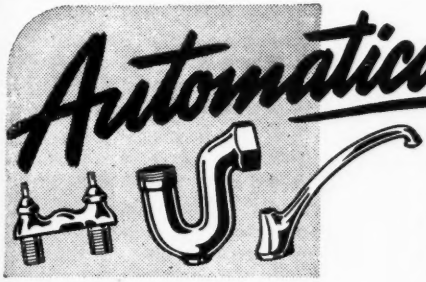
The same type of drive may be applied to other units made by this company in sizes down to 10 lbs. of work per batch.



Hanson-Van Winkle-Munning Motor Driven Oblique Plating Barrel

Heil Steam-Air Agitator Jets

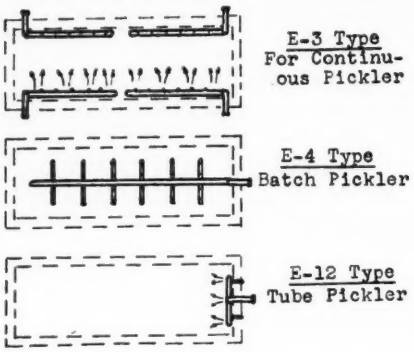
The desire to increase production of steel for Defense with the available facilities in the pickling room has placed particular emphasis on the new E-Series of Heil Steam-Air Agitator Jets used in pickling tanks and manufactured by



● Polished and Buffed — today's efficient method used by progressive manufacturers in doing their part to Aid National Defense.
There's a Packer-Matic for your particular product. Save time, money and increase your production. Write for descriptive literature.

● AUTOMATIC POLISHING & BUFFING MACHINES
Packer-Matic
THE PACKER MACHINE CO., MERIDEN, CONN., U. S. A.

Heil and Company, 3088 W. 106th St., Cleveland, Ohio. Already installed in many continuous sheet mills, these jets are said to increase the tonnage speed



Heil Series E Steam-Air Agitator Jet

through the pickling line from 20 to 40 per cent.

A similar set-up called the E-4 type is available for batch picklers. These produce agitation and heating up through the bottom of pack reducing the black patch rejects; at the same time eliminating the necesstiy of many hairpin spacers, sand, and other subterfuges for separating the sheets or coils.

An E-12 type Steam-Air Agitator is designed for use in tube picklers, permitting either steam or air to be blown through the tubes. This rapidly removes the ganister, producing more effective pickling internally in a shorter period, with the consequent reduction of the usual overpickling of the outer surface.

The results obtained with the Heil E-Series Agitator Jets are derived from strategic placement of jet nozzles allowing for complete agitation of the entire bath. The angle of jet impingement is so arranged that a swirling or rolling action of the bath is effected. These results have long been desired, particularly in large continuous tanks where it has been customary to use conventional corner jets. An immediate deduction can also be made that more uniform heating results from the multiple nozzles and the complete agitation.

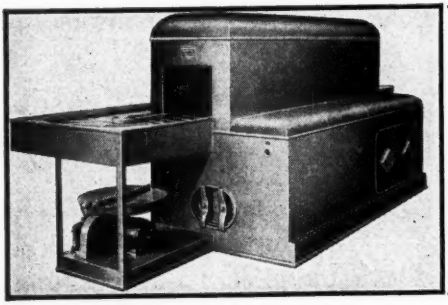
The above mentioned results are made possible by the patented construction involved in the Heil E-Series Jets. The jet stems are made of a ductile lead alloy, extruded into a special reinforced shape. The jet can be made in any length or shape. The nozzles are made of non-metallic Nocorodal which is unattacked in boiling acid pickle, according to the manufacturer. The entire construction is said to withstand corrosive attack of the highest sulfuric acid concentrations developed in modern pickling practice at 220 deg. F. with no appreciable loss of weight.

During periods when steam is throttled by automatic controls, it is suggested that air be used in the same jet to provide continuous bath agitation. The air can also be entrained with the steam. To provide the same agitating effects, a much lower air pressure is required than with steam.

Totalume No. 55

An elastic, rust-preventive paint with a bright, silvery metallic lustre to be known as Totalume No. 55 has been placed on the market by The Wilbur & Williams Company, Park Square Bldg., Boston, Mass. This finish is designed for application on metal products of all kinds and also for the maintenance of production equipment.

Totalume No. 55 is said to have excellent adhesion, even on extremely

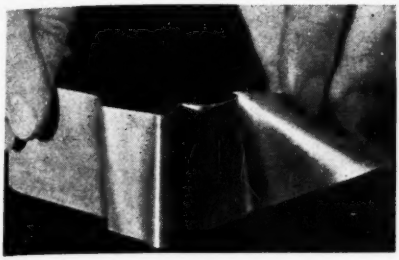


HYDRO-FLOW
Industrial Washing Machines

Streamlined design. Hidden motors, pumps and pipes are easily assembled. Piping and nozzles located to insure thorough cleansing of all surfaces. Rugged and efficient pressure pump. Corrosion resistant spray nozzles—from mist to open stream. Monorail, Belt or Gravity type conveyors designed to carry any shape or size material. Variable speeds on conveyor drive synchronize production.

International Conveyor & Washer Corp.
Write for circular.
640 E. FORT ST. DETROIT, MICH.

smooth surfaces and tin plate. The accompanying illustration shows a strip of tin plate which has been coated with Totalume No. 55 and then bent at several points without the least cracking or chipping of the paint film.



Test panel showing lustre and also crack and chipping resistance of Totalume No. 55

Totalume No. 55 resists heat, and according to the manufacturer, there is no deterioration of the film at temperatures up to 1,000 deg. F. Elasticity is maintained through a temperature range from 100 deg. below zero to 1,000 deg. F. According to the manufacturer, metal coated with Totalume No. 55 can be heated to 700 deg. F. and quenched in ice water without cracking the film.

Totalume No. 55 is said to provide the penetrative and rust preventive qualities of Totrust, another product of The Wilbur & Williams Company, with the sole exception of the application to damp surfaces.

Totalume No. 55 covers from 700 to 1,000 sq. ft. per gallon, depending upon the surface. The material can be applied either by brush or spray, and air dries in three to five hours. For hard baked surface, finished work should be maintained at a temperature of 250 to 300 deg. F. for two hours.

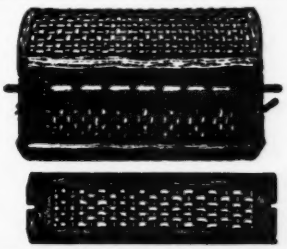
Carbozite Standard "Black-out Black"

Said to meet all authoritative specifications and recommended practices and feature easy removal as well, a black-out coating for industrial plant windows and skylights has been placed on the market by the Carbozite Corp., First National Bank Bldg., Pittsburgh, Pa. The material, which is known as Carbozite Standard "Black-out Black," is a smooth flowing liquid coating manufactured from a pyrobitumen ore especially refined and mixed with quick drying, volatile solvents and a secret ingredient which is said to provide complete opacity and an absolutely gloss-free surface. Of particular importance is the ease of application and unusual durability of the material even under the most actively corrosive conditions.

Carbozite Black-out Black can be sprayed or brushed on quickly. According to the manufacturer, only one coat is required to assure complete protection against light penetration. Drying is completed in six to eight hours, leaving a dead black, gloss-free coating that is said to be as nearly totally non-reflective as can be obtained.

From the standpoint of durability, Black-out Black is said to effectively withstand rain, wind, water seepage, ultra-violet, sulphur, acid and alkali fumes, salt water and salt air, and numerous other destructive agents, including soot, smoke, and electrolytic action. Black-out Black, six or eight hours after application, will not, it is claimed, sag, peel, chip, or check at temperatures ranging from 40 deg. F. to 450 deg. Fahrenheit.

Black-out Black is readily soluble in gasoline, kerosene, naphtha, or any other light petroleum solvent, thus enabling it to be wiped off glass readily

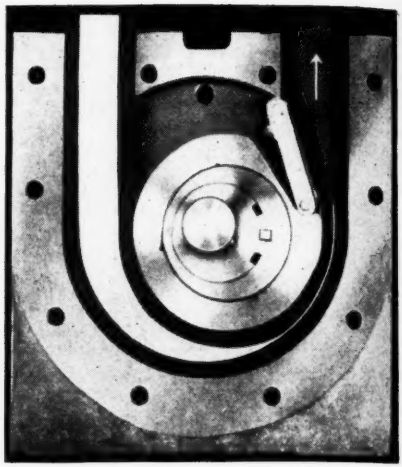
INVESTIGATE
FOR SOMETHING
BETTER
SIZES FOR ANY EQUIPMENT
KING

PLATING BARRELS
Write for illustrated folder.
Use them once—you'll use them always
JOHN KING
48 SPRINGFIELD ST. DAYTON, OHIO

when desired without disturbing other painted surfaces. In locations where the use of volatile solvents such as gasoline involves a safety hazard, Black-out Black can be readily removed with a putty knife or similar scraper, since its coating remains flexible and can be easily removed in a single layer without the use of any solvent or softening agent.

Downingtown-Huber Pump

A squeegee type pump has been placed on the market by the Downingtown Manufacturing Co., Huber Pump Division, Downingtown, Pa. The Downingtown-Huber Pump is entirely different, operating on a new "squeegee principle" which is unlike a centrifugal, rotary, reciprocating, screw, or diaphragm pump.

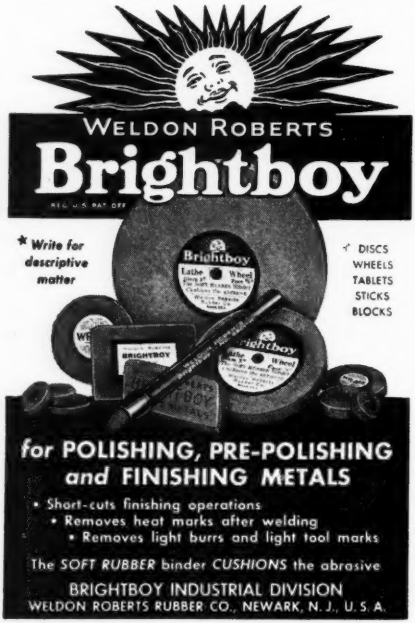
Briefly, it consists of a flexible rubber tube which is alternately squeezed and released in a rocking, squeegee manner so that the liquid or gas is actually breathed into and out of the tube. The liquid or gas being pumped is totally enclosed within the tube, from the time it enters the pump until it leaves, thus it cannot come in contact with any metal part of the pump. The tube itself can be made of pure gum rubber and various acid and oil resisting synthetic materials; in addition, rubber tubes can be lined with synthetic materials for corrosion resistance to prevent contamination.



Downingtown-Huber Pump

Cleaning or sterilization is easy and does not require taking the pump apart. Solutions containing solids, whether abrasive or otherwise are said to cause practically no wear, since the inside of the tube is a smooth, continuous surface, with no projections, corners, crevices, or similar vulnerable places. High percentage of solids, high specific gravity of solids or solutions and viscous or stringy solutions are said to be safely handled, for whatever can be drawn into the pump can be pumped out. No churning or agitation is caused by the pumping action. Likewise, hot or cold liquids or gases do not affect the operation of the pump or the life of the tube.

The pump is noiseless in operation, due to the cushioning action of the tube between moving and stationary parts of the pump. The Downingtown-Huber Squeegee Pump is said to have a high efficiency and a sure, positive action with practically no slippage; therefore, it may safely be used for accurate proportioning. No moving parts of the Downingtown-Huber Squeegee Pump are in contact with the liquid or gas being pumped, except the tube, which is externally compressed and released. In addition, there is said to be practically



no wear on the outside of the tube, since the compressor ring merely rocks against the tube, without any rotating, rubbing action. The repeated flexing of the tube has little effect on its life and when a new tube is required, it can easily be installed without vulcanizing or cementing. The tube is moulded to fit the inside of the metal shell, which forms its support and backing.

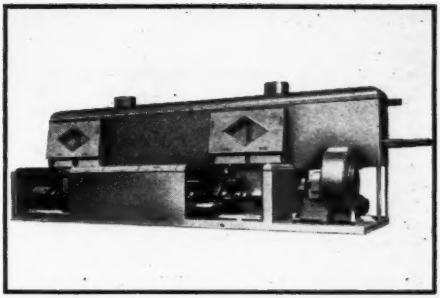
The squeegee operating principle consists of a rotating drive shaft, keyed to an "off center" rotor, which itself is keyed to an adjustable eccentric, the adjustments providing adequate take-up for wear on the tube. The shaft and both rotors all turn as a unit inside the compressor ring, thus pushing the ring out radially against the tube. This action continues progressively along the curved portion of the tube, producing a rocking squeegee action from suction to discharge side. Compression of the tube advances the liquid or gas, while expansion of the tube, back to its normal diameter, produces a high vacuum which inhales more liquid, which will be exhaled in the following cycle of the "breathing-pumping" action. A tube guide plate, attached to the discharge side of the compressor ring, prevents expansion of the tube beyond its normal diameter at this one point under pressure, where the tube is not surrounded by the pump housing or the compressor ring.

The Downingtown - Huber Squeegee Pump requires no foot valves, no priming and no stuffing boxes. Its simplicity and sound engineering construction are said to assure reliability under the most difficult pumping conditions.

International Monorail Type Wash and Blow-Off Unit

The International Conveyor & Washer Corporation, 640 E. Fort St., Detroit, Mich., has placed on the market a monorail type wash and blow-off unit as shown in the accompanying illustration. One of the main features of this unit is a two-pump assembly of the one wash stage. Each pump is valved on intake and discharge lines so that if one is being repaired, the other is available immediately, thus avoiding interruption to the flow of production.

The covers over the pumps are readily opened, thus giving full access to the pumps and valves. The unit shown in the accompanying illustration is equipped with three pumps, the center pump being connected to both wash and rinse tanks.



International Monorail Type Wash and Blow-Off Unit

The blow-off consists of specially slotted ducts that surround the work connected to a No. E type fan. The combination of hot air and the pressure of the air is said to provide a very good drying stage.

Large workpieces that are constructed of heavy material will hold heat and will dry more easily than work of light gauge material and usually does not re-

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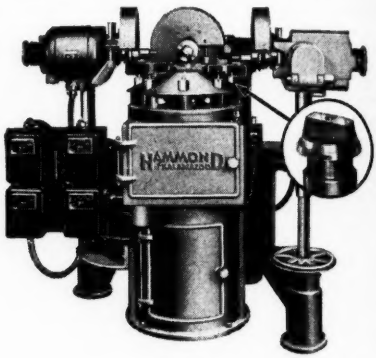
quire the hot air blow off. Generally, the solution of the washing unit is heated by steam coils by means of an injector for initially heating the solution with the coil to be used to carry the load after the desired temperature is reached.

The International Monorail Type Wash and Blow-Off Unit is available as a gas fired unit. This type of unit is of the push through type and exhaust into the spray chamber which tends to assist in keeping the work up to temperature so it will dry more quickly. The gas fired units are available with full automatic controls.

Hammond "J" Rotary Automatic Polishing Machine

For special defense polishing and buffing jobs, Hammond Machinery Builders, Inc., 1622 Douglas Ave., Kalamazoo, Mich., has developed a rotary automatic polishing machine capable of handling a wide variety of circular pieces. Aluminum pistons for aircraft engines, fuse bodies, and engine valves. To change from the polishing or buffing of one piece to another of a different type requires only a simple change of work holders or magnetic chucks.

The machine, which is designated as "J," consists of a circular aluminum



Hammond "J" Rotary Automatic Polishing Machine

table mounted over a heavy cast iron base. The table indexes automatically, rotating six to eight chucks which pass under as many as four polishing heads mounted in pedestals which stand on the floor around the machine. Chucks are stationary during loading or unloading. Spindles carrying the work holders revolve with the table which is driven by sprocket and chain from a speed reducer in the base of the machine. Speed changes are easily made, both in spindle revolutions and number of table indexes per hour.

Polishing heads are independently driven either by V-belts from motor on base or direct from motor on spindle. Controls for all motors are mounted on a master control board conveniently located at the front of the machine.

By means of an exclusive "full floating" arrangement, pressure of the polishing heads can be adjusted so that the buff rides over the work and provides uniform pressure at all points. Buffing wheels may be adjusted to any angle desired. As the table indexes, the wheels automatically lift in and out of recesses as required. Composition is applied to the wheels automatically by air pressure with the Hammond Autodoper, an accessory attachment.

The Hammond "J" Rotary Automatic Polishing Machine is designed for operation by a single operator. The machine shown in the illustration is equip-

THE ADIRONDACKS GORE MOUNTAIN CRYSTAL GARNET ORE

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For
Abrasive Paper and Cloth
Grinding Wheels
Sand Blast
Minus 300 Mesh for
Polishing and Lapping
Grades for Barrel Finishing

Ample Stocks Insure
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BARTON
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NORTH CREEK, WARREN COUNTY, N.Y.

ped to handle circular pieces of all types. By substituting magnetic chucks, the machine can also be used to polish or buff small flats.

Roxalin Lustreless Coronado Tan

A synthetic enamel to be known as Lustreless Coronado Tan has been placed on the market by Roxalin Flexible Lacquer Co., Inc., Box 7121, Elizabeth, N. J. This enamel is designed for use on motorized equipment such as combat vehicles, motor transport trucks, tanks, pontoons, and so on. The finish is designed to reduce visibility of these Army vehicles and equipment by eliminating almost all reflection from the finished surface. The Coronado Tan color is designed to blend in with desert terrain.

Spraying is the normal method of application in commercial establishments and the material will spray satisfactorily when thinned by 15 per cent by volume of thinner Quartermaster Spec. No. ES-370B. Where a pressure tank system is used, approximately four to six pounds per square inch is required on the liquid and approximately 55 lbs. per sq. in. air pressure is recommended. A uniform flat coat of material should be applied, which, owing to its lustreless properties, dries rapidly in the initial stages.

Roxalin Lustreless Coronado Tan will brush satisfactorily when used unthinned in the original package consistency or when thinned no more than five per cent by volume with thinner—Quartermaster Spec. ES-370B. The material flows sufficiently so that a brushed surface is normally free from streaking, sags or runs, and with a minimum of brush marks. A medium coat should be applied, normally resulting in approximately 1.5 to 2.5 mils thickness in the dried film. According to the manufacturer, this will provide complete hiding of the primer.

Valdura "Defense Line" Paints

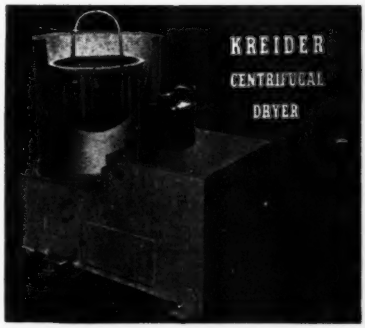
A line of five new paints, designed to provide civilian markets with products to replace now unavailable aluminum paints, has been announced by American-Marietta Company, 43 E. Ohio St., Chicago, Ill. Introduced as members of the company's "Defense Line" and tailored for both new construction and maintenance applications, they may be applied by brushing or spraying.

Valdura Tank White has been introduced to replace aluminum paint in applications where it is desirable to cut evaporation losses and to reduce inside temperatures. With a reflectivity factor 10 to 15 per cent higher than aluminum paints, it is resistant to oil and water. Coverage is about 450 sq. ft. to the gallon with brush or spray.

Valdura Metal Lead paint provides a fine protective, lead-colored metal coating for all metal surface, including new or old galvanized metal. Metallic lead provides a leafing action similar to that of aluminum, affording a coating which is said to be highly resistant to acids and alkalis, and to fumes, rust, and moisture. It will set in two to three hours, will dry in 10 hours, and resists temperatures up to 225 deg. F. Rated coverage is approximately 600 sq. ft. of clean metal per gallon. It may be used as a general metal primer under any paint except those containing asphalt.

Two Valdura Defense Grays, available in light and neutral shades, are designed to provide low-cost effective protection and long durability on exposed metal surface. Permanent elasticity is provided in the paint film, assuring years of rugged service on oil and gas tanks, iron fences, structural steel, water towers and power line towers

Better, Faster Drying



Kreider Centrifugal Dryer gives you fast, easily controlled drying—reduces your finishing costs. This modern, high-speed dryer is simple in design, easily operated by one semi-skilled worker.

All steel, welded construction • Built-in belt tightener • Anti-friction bearings • Alemite fittings • Heating unit available.

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DELLINGER MFG. CO., 729 N. Prince St., Lancaster, Pa.

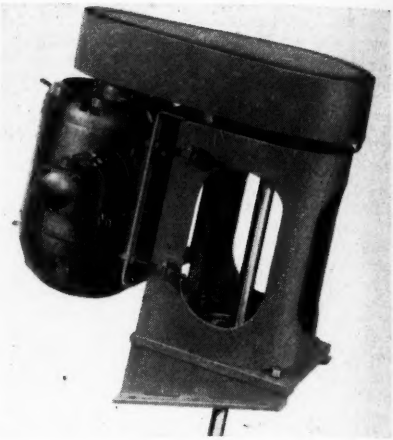
where there is appreciable expansion and contraction due to temperature changes. Both colors have high gloss finishes, and are said to be highly resistant to rain, sun, grime, smoke, and rust. Coverage is 450 sq. ft. per gallon.

Valdura Enamelized Yellow Metal Primer is designed for all types of metal surfaces, particularly where metal is subjected to extremely damp, wet and foggy conditions. It may be used under water when covered with one or two coats of Defense Grays. Its light yellow color permits use of a single coat of paint to hide the primed surface. Coverage is 500 sq. ft. to the gallon.

Vee-Belt Drive Top Entering "Lightnin" Mixer

The announcement of a new vee-belt drive "Lightnin" Top Entering Mixer extends the many advantages of this type of drive to top entering mixers for the first time, according to Mixing Equipment Co., 1038 Garson Ave., Rochester, N. Y. The new unit is available for use over open tanks, closed tanks, pressure or vacuum vessels and for attachment to standard size vessels.

One of the features of the unit is flexibility of drive. The speed can be changed merely by changing the sheave and pulleys or a variable speed pulley can be provided on the motor which allows approximately 25 per cent speed variation. This permits the user to adjust his speed to just the right agitation, or if the viscosity is increased due to change in specifications of materials, the speed can be decreased so as not to overload the motor. Since the speed can be varied from 400 to 600 r.p.m., this drive is suitable only for propeller type impellers and not for turbines.



Vee-Belt Drive Top Entering "Lightnin" Mixer

The vee-belt drive on these mixers can be furnished with electrically conducting belts to do away with danger from static electricity in hazardous locations. It can also be furnished with oil resisting belts where necessary.

Delivery time is less because a standard horizontal NEMA frame motor is used instead of a gear motor. Motors can be standard, semi-enclosed, drip proof or totally enclosed, air jacketed or explosion proof as required for service. Vee-belt feature permits interchange with processor's own motor and enables purchaser to use mixer for a considerable number of different processes.

Shafts and impellers are selected and varied according to the materials being mixed and can be made from any machinable metal or alloy. Units range in size from 1 to 25 h.p. and may be mounted in any desired fashion on any size or shaped tank in minimum time.

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Sunray Fluorescent Lamp

The latest development in the line of fluorescent lamps now being manufactured by Sunray Electric, Inc., Warren,

Sunray Fluorescent Lamp

Pa., is shown in the accompanying illustration. This unit has been designated as Sunray Fluorescent Lamp and is said to be the smallest of the standard type fluorescent lamps commercially available.

The Sunray Fluorescent Lamp is 15 in. in over-all length and is said to offer advantages of flexibility in lighting applications. The unit is 1½ in. in diameter and can be used with the standard 20 watt and 40 watt lamps manufactured by this company. It is especially adaptable where a close source of glare-free light is required. Rated at 14 watts, the Sunray Fluorescent Lamp is available in both white and daylight.

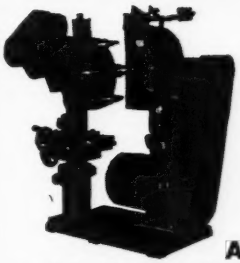
Industrial Instruments Solu-Bridge

Of prime importance in maintaining a uniform grade of work is the solu-bridge method of checking pickling bath concentrations and similar solutions. At the mere twist of a knob the average plant worker can instantly and accurately determine the strength of the bath, thereby knowing when and how much to add to keep that bath at given strength.

The usual pickling solutions, normally run about five to six per cent sulfuric acid, and in the pickling of brass parts the solution becomes contaminated with copper sulfate. The percentage of copper sulfate at times may run as high as two per cent and the workers must obviously be made aware of the diminishing acid content if they are to maintain uniform quality of work.

This commonplace problem in metal finishing is being met by checking pickling solutions with the solu-bridge. This instrument, developed and offered by Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J., is just a rugged, simplified, shop type Wheatstone bridge utilizing the "magic eye" as the indicator of balance, and serving to measure the electrical conductivity of the solution in the desired terms. The readings are obtained directly by turning a knob until the "magic eye" indicates balance. The instrument can be operated by any plant worker, with speed and accuracy. In the case of pickling solutions the readings are obtained in terms of sulfuric acid concentration. Model RD-B6 instrument was developed especially for this purpose at the request of one of the major cartridge manufacturers of the United States. It is calibrated for 0-10 per cent as H_2SO_4 with the scale arranged for easy reading in the range about five per cent. Other ranges of calibration

Get Hep to This for Polishing and Buffing! Faster and Cheaper



ACME SEMI-AUTOMATIC and Lathe Combination Unit

One of the many Acme Automatics designed to speed up production and reduce production costs. Send sample for free production estimate.

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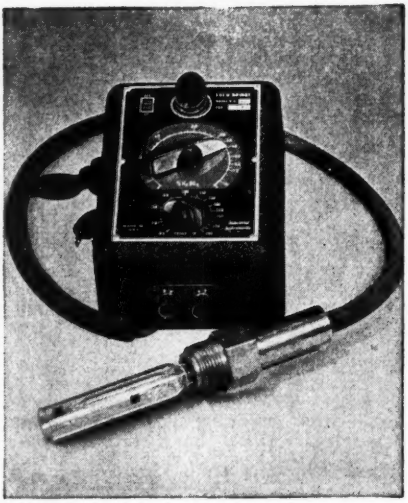
Builders of Automatic Polishing and Buffing Machines for Over 25 Years



Industrial Instruments Solu-Bridge

in terms of different percentages of sulfuric acid, sodium hydroxide or reciprocal ohms x 10^{-6} are available on order.

Electrical contact with a precise volume of the solution is established by means of a dip cell made of rubber with nickel electrodes, immersed in the bath only for a short time when readings are taken. If, for greatest convenience in taking frequent readings, it is desirable to have the conductivity cell remain constantly in the solution, then a glass conductivity cell with platinum electrodes, mounted in a stainless steel sleeve that screws into a ¾ in. pipe thread in the side of the tank, is used.

Since copper sulfate has a conductivity only 1/10 that of sulfuric acid, the effect of copper sulfate proves negligible. The same check-up technique is being applied to many other industrial solution concentrations where the electrical conductivity can be translated into desired readings. Much time, labor, and guesswork are being minimized in these intensified days of National Defense production, by means of the solu-bridge technique.

Stabilisal "B"

A material specifically recommended as an addition to clear metal lacquers to be known as Stabilisal "B" has been placed on the market by Advance Solvents & Chemical Corp., 245 Fifth Ave., New York, N. Y. This material is recommended for preventing greening of dipping lacquer in the tank and restoring the original color of lacquer already turned green.

Stabilisal "B" is a liquid which is readily measured out and easily mixed into the lacquer. No special procedure is required and there is said to be no effect on the lacquer's performance in regard to the durability, adhesion, and other essential characteristics. The amount to use will depend somewhat upon the stability of the cellulose nitrate, the acidity of the resins and solvents present, and on the ease with which the solvents hydrolize. Normally, one part of Stabilisal "B" to 400 or 500 parts of lacquer is recommended.

Ernst Magic Drum and Barrel Carrier

A "Little Giant" model has been added to the line of Ernst Magic Drum and Barrel Carriers which are marketed by Ernst Magic Carrier Sales Co., 1456 Jefferson Ave., Buffalo, N. Y. This

BLACK for Iron and Steel

Original, low temperature, patented method

Superior

ABRASION-RESISTANCE
RUST-RESISTANCE
ECONOMICAL . . . FAST

Government-approved. Sample JETALized free.

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the JETAL process

BETTER PLATING, LESS COST!
"MGC" ELECTROPLATING EQUIPMENT
Write for Interesting Details TODAY!
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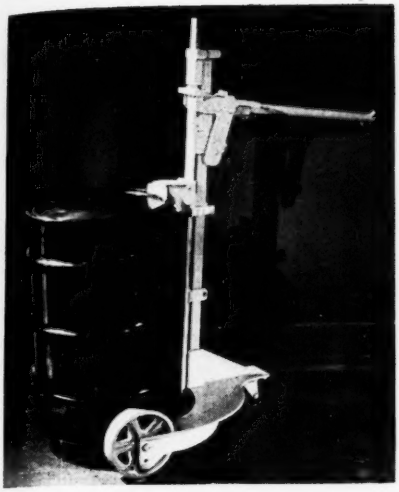

Ernst Magic Drum and Barrel Carrier

model was designed and constructed for handling drums which are principally used as containers of heavy materials.

Built into this new model are the money saving, time saving, floor saving, container saving, and labor saving features that have made the larger models famous. One man using only one hand with an Ernst Magic Carrier takes the place of several men formerly required to break-over, balance and move drums. In addition, all accidents common to handling loaded containers are said to be prevented by the simple lifting device and self-balancing trihweel design built into these carriers.

Combined with these safety features are easier, speedier, less work, lower cost factors that are important in stepping up production in materials handling. Copper silicon alloy metal wheels and locking device are available where precaution against explosions is necessary.

This new Little Giant model with capacity up to 600 lbs. provides a wider range of Ernst Magic Carriers with capacities up to 1500 pounds.

Detrex Processing Machine for Aluminum Alloys

The two-strand, cross-rod conveyorized Detrex Processing Machine shown in the illustration herewith has been specially designed and built by Detroit Rex Products Co., 13005 Hillview Ave., Detroit, Mich., for the cleaning and treatment of metal parts. It follows an approved U. S. Army and British procedure for the treatment of aluminum alloy sheets used in aircraft to make them less pervious to the effects of air, and to provide a better paint bond.

This machine incorporates hot alkali wash, hot water rinse, hot chromic acid dip, hot water rinse, and oven dry off.

The Detrex processing machine has the advantages of a compact self-contained unit that eliminates special handling systems and tanks spread out over a large floor space. Further floor saving is obtained by the oven being located over the top of the dip tanks, with the return flight of the conveyor passing overhead through the oven back to the loading-unloading station. Another important feature of this simplified and condensed set-up is that both steam and acid fumes are positively withdrawn from the plant so that operating conditions are greatly improved. This unit also makes important savings by eliminating rehandling the work.

It is fabricated from steel plate, reinforced with structural steel, and is of

RUST-I-CIDE "50"

CLEANS METAL *Easily and Quickly*

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. . . and provides a foundation for good, lasting finishes.

RUST-I-CIDE '50'

★ Imparts better adhesion by mildly etching.

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★ Chemically cleans—dissolves and *removes* common shop accumulations.

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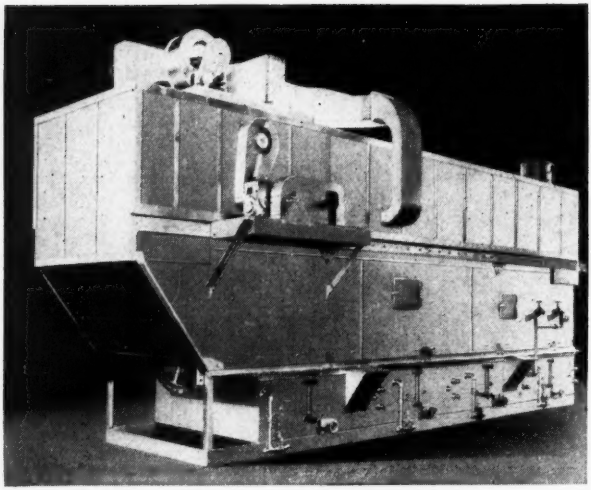


Detrex Processing Machine for aluminum sheets and parts incorporating alkali wash, water rinses, chromic acid dip, and overhead drying oven.

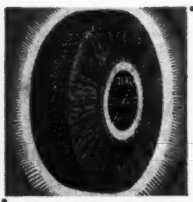
all-welded construction supported on structural steel sill. The oven paneling is insulated with fibre glass.

The hot alkali tank, hot water rinse tanks, and chromic acid tank are heated by multi-pass steam coils, tested for a working pressure of 200 lbs. per sq. in. Each tank is equipped with a gauge glass, drain valve, direct-reading dial thermometer, and quick-opening clean-out door. The alkali and chromic acid tanks are equipped with charging hoppers. Each tank is provided with an overflowing scum trough. Large inspection doors are provided over the tanks and large access doors are located at the rear end of the unit, one over the final hot water rinse tank and one in the oven. The hot chromic acid tank is supplied with a direct-acting, self-operated temperature regulator. Duct work and blower are arranged to exhaust from each end of the washer, and from the chromic acid stage. The dry-off oven is heated by a blast heater arranged for high pressure steam. The conveyor drive is complete with roller chain drive, shear-pin-hub sprocket, double wormgear reducer, variable speed motor pulley and base.

The processing machines are built in various sizes to accommodate individual production requirements. The unit shown, for example, has the following approximate overall dimensions: Length, 29 ft. 10 in.; Width, 13 ft. 9 in.; Height, 14 ft. The work clearances through the machine will accommodate baskets 48 in. long by 18 in. wide by 12 in. deep, 18 in. hanging from the center line of the crossrod to the bottom of the basket. The approximate weight is 17,400 lbs.

Plastic Lined Acid Pump

The pump shown in the accompanying illustration is now being manufactured by A. R. Wilfley & Sons, Inc., Denham Bldg., Denver, Colo. One of the features of this pump is a plastic lining of Haveg material. The unique construc-



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LEATHER — CANVAS

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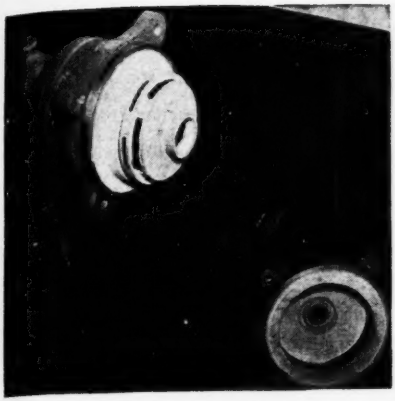
"B-4 Chrome" Cleaner

(No obligation, of course)



Haveg Lined Acid Pump

tion employed in the manufacture of this pump affords a method of fabrication in which no metal comes in contact with the solution which is being pumped. In addition, there are no rubbing contacts between the Haveg impeller and the lining of the pump casing.

The plastic lined acid pump can be supplied with both Haveg 41 which is especially resistant to hydrochloric acid solutions of any concentration and to many other acids, bases, solvents, and other chemicals, or Haveg 43 which is resistant to hydrofluoric solutions. The accompanying illustration shows the plastic lined acid pump disassembled exposing the Haveg lining and the Haveg impeller.

Valdura Black-Out Paint

A black-out paint for use in darkening windows and skylights of industrial and commercial properties where it would be impractical to extinguish lights at the sound of an air-raid warning has been announced by American-Marietta Company, 43 E. Ohio St., Chicago, Ill. The product is to be known as Valdura Black-Out.

Valdura Black-Out had been undergoing development in the company's laboratories for several months with the thought that it might, at some future date, find application in some outlying United States possessions. Final tests were speeded with the Japanese attack on United States possessions in the Pacific and commercial production started ten days later.

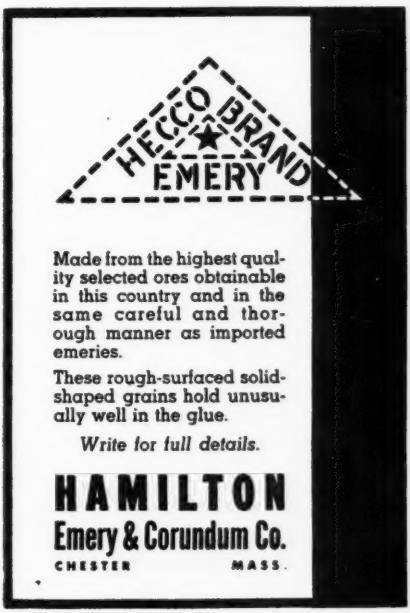
The paint is being marketed in paste form and, when cut 50 per cent with water, can be sprayed or brushed on windows to prevent all passage of light. Coverage is 800 sq. ft. to the gallon. It dries within 40 minutes and is said to provide a flat surface that will not flash back or glare when hit by artificial light used within the room. In interior applications, a single coat may be covered with a white paint where large glass surfaces make the higher reflection properties of a white surface necessary.

According to the manufacturer, removal of the product can be made without damage to the glass. It is available in one and five-gallon containers.

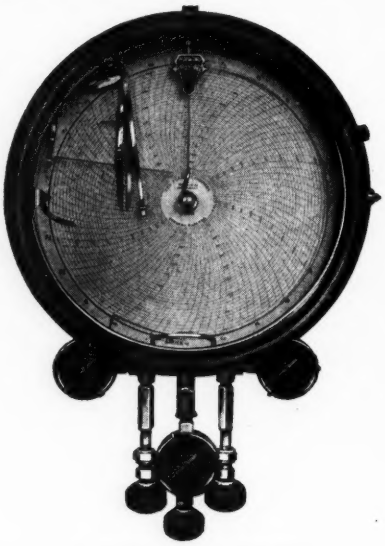
Foxboro Duplex Controller

The Foxboro Company, Foxboro, Mass., has placed on the market an automatic temperature control to be known as the Foxboro Duplex Controller for application in electroplating processes. This unit is said to provide such accurate control for plating temperature that it might well be described as "made for the job."

The control mechanism of the Foxboro Duplex Controller will operate on a temperature change of as little as ¼ of 1 deg. F. and its corrective action is said


HECO BRAND
EMERY
Made from the highest quality selected ores obtainable in this country and in the same careful and thorough manner as imported emeries.
These rough-surfaced solid-shaped grains hold unusually well in the glue.
Write for full details.
HAMILTON
Emery & Corundum Co.
CHESTER
MASS.

to be so alert that the chart record will show practically an even line throughout the working day. In addition to the Duplex Controller, which



Foxboro Duplex Controller

automatically operates both heating and cooling valves, other models of the Foxboro Controller are available for use in plating applications where only a single valve on the heating or cooling line is operated.

The Foxboro Duplex Control is equipped with a chart which is visible at all times, thus providing an operating guide for the plater and when examined in the superintendent's office, provides daily assurance that the plating operations are being carried out under the conditions prescribed for uniformly satisfactory results.

The Foxboro Duplex Controller combines within one case two separate and complete control mechanisms. One of these operates the control valve in the steam line and the other operates the cold water supply valve. When the bath temperature reaches the high point or the low point for which the control has been set, the proper valve is opened, to cool or heat the bath as may be required to maintain it at its proper temperature. Because the temperature measuring system is of the vapor pressure type, control action is immediate and wide variations in bath temperature cannot occur.

A pair of index pointers, positioned by a convenient setting device, indicates on the chart the high point and the low point at which the two control valves are to operate. A micrometer screw permits the adjustment of the pointer spacing so that the temperature difference between high and low may be less than one per cent of the chart range.

The Foxboro Duplex Controller is a sturdy industrial instrument, designed and built for industrial conditions. Its gasketed die-cast case closes securely against dust, moisture, and vapors. It is furnished in three types of mounting and can be located wherever it may be most convenient.

Hanson-Van Winkle-Munning Plating Tank Net

A new aid to good electroplating practice has been placed on the market by Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturer of electroplating equipment and supplies. This device is the HVWM Tank Net. These

RECOVERED TALLOW

An excellent Tallow reclaimed from Harness Leather. This product is unusually high in heat resistance, due to the absorption of the natural chemical properties contained in harness leather.

Write for samples and quotations.

M. ROSS MASSON COMPANY
Dept. P.F.
2160 Montcalm St., Indianapolis, Ind.

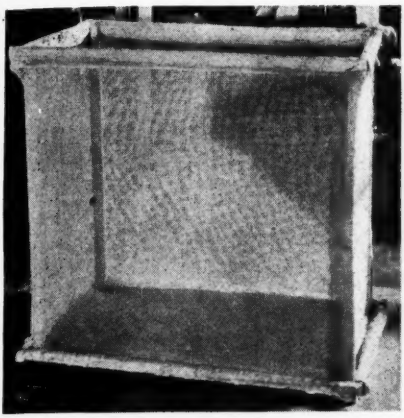
TANK SLUDGES ARE VALUABLE

We will purchase Tin—Cadmium—Tungsten —Molybdenum sludges and residues.
Any quantity.
Send samples—Will quote promptly.
Also buyers of all grades of plating room scrap.

Metallurgical Products Co.
Established 1909
Converters—Reclaimers—Processors
35th and Moore Sts. Philadelphia, Pa.

nets are placed in plating tanks so that any work dropped may fall into the net; thus any work dropped is easily recovered by simply lifting the net out of the solution.

This net is made of ½ in. stretched



Hanson-Van Winkle-Munning Plating Tank Net

mesh, hung square, 6 thread medium twine, made to dimensions as specified. Tape is sewn in form of loops along top and bottom of both ends and sides large enough to accommodate a rod up to 1½ in. in diameter.

These nets can be used in nickel, cyanide copper, Mazic zinc, acid zinc and cadmium solution to advantage. They are not suitable for alkaline cleaners or sodium stannate tin solutions.

One of the largest camera manufacturers and two well-known optical concerns in the country are said to have been using nets of this type for the past two years in 9H nickel solutions with very satisfactory results. These concerns plate mostly brass, copper, and die cast parts which, when dropped to the bottom of the tank, cannot be recovered with a magnet. They advise that contamination and consequent poor plating has decreased tremendously with the use of these nets.

Exola Fast Penetrating Rust Solvent

Guaranteed to loosen rusted and corroded parts of all and every combination of metals regardless of how badly frozen together, a fast penetrating rust solvent, to be known as Exola, has been announced by Patrick-McDermott & Co., 2706-8 S. Hill St., Los Angeles, Cal. By combining chemically with rust or corrosion, Exola is said to form a metal stearate similar to grease which immediately loosens all metal parts to which it is applied, yet is harmless to the metals themselves.

Exola Rust Solvent is available in pint, quart, and gallon containers and 30 and 50-gallon drums.

Link-Belt Self-Aligning Idler for Flat-Roll Conveyor Belts

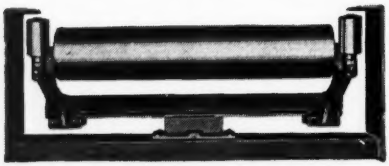
A swiveling, positive, self-aligning idler for automatically correcting misalignment of either carrying or return runs of non-reversing conveyor belts supported on flat-roll idlers is announced by the Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind. The idler has a centrally pivoted cross member which, besides being equipped with a flat idler roll for supporting the belt, has a vertically mounted actuating roll at each end which lightly contacts the edge of the belt when its lateral misalignment exceeds a predetermined amount. Since but a slight pressure

1-9-4-?

Some year the war will end.
Swords will be beaten back into plowshares, and golf clubs and refrigerators.
There will be a swing back into the things we buy because we like them and not because they are a grim necessity.
You are planning these things now, or should be.
Let us plan with you toward the finish for 194?, whenever it is.
We welcome any call for co-operation on long-range planning for the finish of the future.
Meantime, for 1942 and as far as we can see, we shall do our utmost to supply our customers with the best available materials and service permitted by wartime conditions.

The Varnish Products Co.
5208 Harvard Ave. Cleveland, Ohio

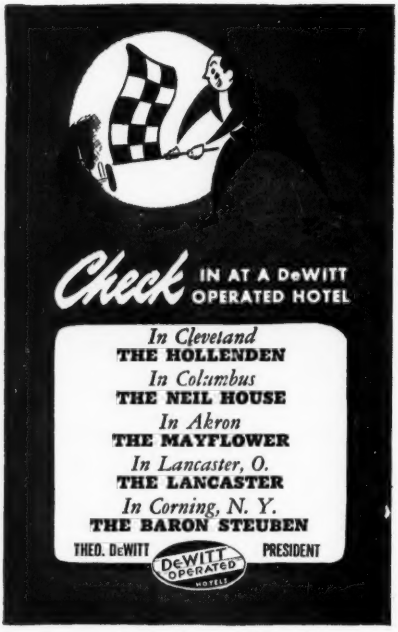
of the belt edge against the actuating roll serves to swivel the idler unit on its pivot sufficiently to guide the belt automatically, quickly, and positively



Link-Belt Self-Aligning Idler for Flat-Roll Conveyor Belts

back to proper alignment, any possibility of injury to belt edge is said to be eliminated.

When used on return runs, one idler should be placed close to the tail or take-up shaft so that the belt will be guided centrally on the pulley, and one at every 10 or 15 idler spaces. On the carrying run, one idler should be placed just beyond the loading chute and one at every 10 or 15 spaces thereafter. For flat-roll belt conveyors that must operate in either direction, self-aligning idlers of special design are available.



Drying Lamps for the Application of Heat with Radiant Energy. A 16-page catalog written by Howard Haynes and R. L. Oetting on the subject of drying lamps is now being issued by General Electric Company, Nela Park Engineering Department, Cleveland, Ohio. The content of the book is as follows: Design of Drying Lamp Installations, Flat Safety Precautions, Measurement of Radiant Energy, Available Drying Banks, Cylindrical Tunnels, Other Tunnels, Portable Banks, Water Evaporation and Mass Heating, Paint Baking, Lamps, Physical Data Tables.

Copies of "Drying Lamps for the Application of Heat with Radiant Energy" are available at 15 cents each.

Cambridge Precision Instruments. Plant operators in the process industries and also power plant engineers, as well as research men and manufacturers in general, will find much of interest in List CEC issued by Cambridge Instrument Co., Inc., 3732 Grand Central Terminal, New York, N. Y. It describes industrial models of analyzers, indicators and recorders that measure with laboratory accuracy.

Recording gas analyzers, together with pH and other equipment for making precise measurements that effect savings of time, material, and labor in production, are featured in this folder. It also invites inquiries on instrument problems. Copy free upon request.

General Electric Equipment for Chemical Plants. Publication GED-978, now being issued by the General Electric Company, Schenectady, N. Y., describes and illustrates electric equipment that General Electric has available for the chemical industry.

Motors, motor control equipment, switchgear, power conversion equipment, and electric apparatus for material handling are discussed in detail, as well as voltage transforming equipment, voltage regulating equipment, power-factor improvement equipment, instruments, and automatic process timing switches.

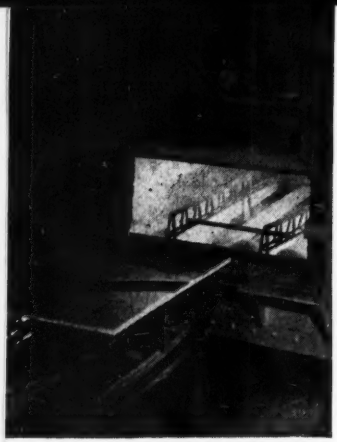
Installation information is given and numbers of publications further describing each item are listed.

Copy free upon request.

Defense Savings Bonds are now available at more than 16,000 post offices and 9,000 banks throughout the United States.

The Finishing Touch — **By J. A. Patterson**

"Th' boss says he's gonna break them birds of comin' in late, or else."



FOR YOUR *Catalog* LIBRARY

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Bakelite C-9 Resins

Bakelite Resins designated as C-9 for the paint and varnish industry are described in a non-technical 12-page bulletin now being issued by Bakelite Corporation, 30 E. 42nd St., New York City.

2. Corrosion Resistant Chemical Equipment

The Haveg Corporation, 34 Chapel St., Newark, Del., is now issuing an eight-page catalog completely describing its line of plastic chemical equipment.

3. Metal Cleaning Information

An eight-page catalog entitled "Useful Information on the Properties of Orthosil" is now being published by Pennsylvania Salt Manufacturing Co., 1000 Widener Bldg., Philadelphia, Pa.

4. Anodizing Aluminum by the Chromic Acid Process

The Mutual Chemical Co. of America, 270 Madison Ave., New York, N. Y., is now issuing a 24-page catalog describing the anodic treatment of aluminum.

5. Nuglu Liquid Cold Glue

A 24-page booklet explaining the application of Nuglu for setting up polishing wheels, belts, and discs is now being issued by J. J. Siefen Company, 5657 Lauderdale, Detroit, Michigan.

6. Tools For Defense of America

A 46-page catalog describing a complete line of electric tools for defense industries is now being issued by Skilsaw, Inc., 4743 Winnemac Ave., Chicago, Illinois.

7. Durcopumps

Bulletin No. 810 illustrating and describing in detail, with complete dimensions for all sizes, a series of pumps manufactured by The Duriron Company, Inc., 450 N. Findlay St., Dayton, Ohio, is now being issued by the company.

8. Industrial Styling with Color

A beautifully illustrated catalog depicting advertisements which have appeared in various magazines on Pittsburgh Industrial Finishes is now being issued by Pittsburgh Plate Glass Co., 2121 Grant Bldg., Pittsburgh, Pennsylvania.

9. Industrial Instruments for Plating Operations

Concise descriptions of Foxboro Instruments designed for use in the plating department are described in an eight-page catalog now being issued by The Foxboro Company, Foxboro, Mass.

10. Portable Cleaner

A portable cleaner designated as "3 in 1" for cleaning of dust, grit, filings, and turnings is described in a folder now being issued by Ideal Commutator Dresser Company, 1031 Park Ave., Sycamore, Illinois.

11. General Electric Immersion Heaters

Bulletin GEA-3195 now being issued by General Electric Company, Schenectady, N. Y., tells how to heat electroplating baths with General Electric Immersion Heaters.

12. Automatic Temperature Control in Electroplating Processes

A six-page folder illustrating and describing installations of automatic temperature control in plating operations is now being issued by The Foxboro Company, Foxboro, Massachusetts.

13. Industrial Washing Machines and Conveyors

A folder telling how seven famous companies solved their product washing problems is now being issued by The Alvey-Ferguson Company, 75 Disney St., Cincinnati, Ohio.

14. Park Finishing Bulletin

A 4-page bulletin describing polishing, rubbing, and buffing compositions, and Kold Grip Grain Cement is now being issued by Park Chemical Company, 8074 Military Ave., Detroit, Michigan.

15. Hammond Variable Speed Lathe

A four-page folder illustrating and describing a method by which speed changes of 1,500 to 3,000 r.p.m. can be obtained instantly on the Hammond VRO Polishing and Buffing Lathe is now being issued by Hammond Machinery Builders, Inc., 1622 Douglas Ave., Kalamazoo, Michigan.

16. Airway Ventilated Buffs

Cool cutting buffs for high speed buffing operations are illustrated and described in a 4-page folder now being distributed by Jackson Buff Corporation, 20-03 41st Ave., Long Island City, New York.

17. Polishing and Buffing Wheels

The advance line of polishing and buffing wheels for the metal-finishing industry is described in a 28-page illustrated catalog now being issued by Advance Polishing Wheels, Inc., 844 W. 49th Pl., Chicago, Illinois.

18. Metal Cleaning Tips

The chemical classification and selection of alkaline metal cleaners is contained in a bulletin which has been prepared and is now being distributed by the Cowles Detergent Company, 7016 Euclid Ave., Cleveland, Ohio.

19. Du Pont High Speed Brass

The Electroplating Division of E. I. du Pont de Nemours & Company, Wilmington, Del., is now issuing a catalog on the rapid production of smooth, bright brass deposits.

20. Chromium Chemicals

The uses and technical properties of chromium chemicals are described in a booklet which is now being issued by Mutual Chemical Co. of America, 270 Madison Ave., New York City.

21. Heavy Duty Grinders and Buffers

The complete line of Marschke Heavy Duty Grinders and Buffers manufactured by Vonnegut Moulder Corporation, 1845 Madison Ave., Indianapolis, Ind., is illustrated and described in a 22-page catalog now being issued by the company.

22. Profits in Air

The manner in which electrostatic air filters help industrial plants eliminate losses resulting from contamination of products by dust, smoke, and fumes is described in a four-page folder which is now being issued by American Air Filter Co., Inc., 242 Central Ave., Louisville, Kentucky.

Print plainly in filling out coupon for literature.

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